NUESTRA COMMUNIDAD, NUESTRA SALUD:

A Public Health Adventure
at the
Arizona-Sonora Border

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I. INTRODUCTION

The development of this internship resulted from my desire to attain enhanced knowledge regarding the complexities of US-Mexico border health as well as explore the healthcare system of another country. Ideally suited to my internship expectations, the *Nuestra Communidad, Nuestra Salud* (NCNS) project provided a multidimensional approach to border health care including a diabetes case management component and a community health component. Through establishment of case management clientele and participation in a newly developing border health project, known as the *Centro de Estabilizacion Medica de Nogales, Sonora*, I was provided the opportunity to examine rural border healthcare as well as international healthcare interests while remaining in the southern Arizona region. Located primarily in Nogales, Arizona, NCNS utilized the Southeast Arizona Area Health Education Center (SEAHEC) as its headquarters.

Through participation with several agencies throughout my internship, I was provided an excellent opportunity to become fully engaged in border healthcare. The sister cities of Nogales, Arizona and Nogales, Sonora provided the setting through which I could completely explore the complexities of border health. The small town of Nogales, Arizona (pop. 30,000) directly joined the much larger city of Nogales, Sonora (pop. 150,000 – 300,000) at the Arizona-Sonora border and demonstrated the free flow of people and culture between these border cities that greatly impacts the complexity and delivery of border healthcare. Direct patient care and public health delivery issues at the border were examined through interactions with the Arizona Department of Health Services' Office of Border, the *Hospital General de Nogales, Sonora*, Holy Cross Hospital, and Mariposa Community Health Center.

This report will outline my internship goal and objectives and discuss, in detail, the agencies through which I primarily accomplished them. A full description of each component of the internship is provided as well as a discussion of my responsibilities and activities with each agency I was involved with. As my internship was split between two primary agencies, NCNS and the ADHS Office of Border Health (with NCNS serving as the "umbrella" agency), the individual components of my overall internship will be discussed separately. Since I spent approximately 80% of my internship time with the *Centro* project through the Office of Border Health and 20% with NCNS in diabetes case management, this report is

purposefully more detailed towards the *Centro* project. Additionally, a fully detailed project report for the *Centro* project can be found in ***Appendix C***.

Of special note, I am currently collaborating with Dr. Terry Valenzuela of the Department of Emergency Medicine at UMC in crafting a manuscript detailing the planning, development, implementation, and evaluation process behind the *Centro de Estabilizacion Medica de Nogales, Sonora* project. Upon completion and final review by the Arizona-Mexico Border Health Commission and the US-Mexico Border Health Commission (tentatively planned for April or May 2003), the manuscript will be submitted for publication in the "Concepts of Emergency Medicine" section of the *Annals of Emergency Medicine*.

II. INTERNSHIP GOALS, OBJECTIVES, and TASKS*

A. Goal

Enhance my understanding of the medical and public health issues of rural US-Mexico border health care through participation with *Nuestra Communidad, Nuestra Salud* and the Arizona Department of Health Services, Office of Border Health.

B. Learning Objectives

I. Interdisciplinary Case Management Team Component

a. Describe the concepts and framework of an interdisciplinary team approach to case management and its advantages for practice in rural areas.
b. Participate in an interdisciplinary team and describe the contributions which various disciplines provide to the overall function of the team.
c. Describe role of community health workers (*promotoras)* in context of case management.
d. Provide case management for diabetic individual(s) within the Nogales, AZ community using the Omaha system model.
e. Identify the availability and accessibility of resources, and lack there of, for diabetic individuals within the Nogales community.

II. Community Health Component

a. Work in collaboration with the ADHS Office of Border Health; Binational Health Council; US-Mexico Border Health Commission; AZ-Mexico Border Health Commission; and, Secretaria de Salud of Sonora, Mexico as well as TMC, UMC, and Holy Cross hospitals in development of a stabilization and triage unit in Nogales, Sonora.
b. Describe the structure and function of the binational agencies involved in the development of the unit.
c. Describe the CANAMEX corridor and its potential impact on the economy and health care of the Ambos Nogales community.
d. Describe the background and needs assessment for establishment of the unit to provide a baseline for future assessments of the impact of the unit. This will be accomplished through quantitative and qualitative data gathering strategies.
e. Participate as a member of an evaluation team to produce measurable objectives for the evaluation model of the unit.

III. Overall

a. Recognize how social, political, economic, and historical factors impact the health of a rural border community and the individuals living within it.
b. Recognize the cultural influences on and barriers to health care in the Ambos Nogales community.
c. Enhance my proficiency and fluency in the Spanish language.

*A copy of the original internship goals, objectives, and activities can be found in *Appendix A*.

III. AGENCY COMPONENTS

As my internship consisted in participation with two separate agencies (*Nuestra Communidad, Nuestra Salud* and ADHS, Office of Border Health), the components of each will be described separately.

A. *Nuestra Communidad, Nuestra Salud*

Nuestra Communidad, Nuestra Salud served as the "umbrella" agency for my internship project. The overarching goal for NCNS is to "increase the training, recruitment, and retention of health care professionals who have the relevant knowledge and skills for practice in rural communities" (NCNS, 2003). As a US Department of Health and Human Services (DHHS) grant program through the Health Resources and Services Administration's (HRSA's) Bureau of Health Professions (BHPr), this grant program provides the funding necessary to provide training to nursing, pharmacy, social work, public health, medical, and nutrition students. The program was developed based on the following three types of needs: (1) "training needs of health profession students," (2) "need of the target community for population-based health promotion and disease prevention program," and (3) "need of the target clinical population, Hispanic adults with diabetes, for culturally sensitive, continuing care" (NCNS, 2003). These three needs are fulfilled through a variety of NCNS-sponsored activities including participation in interdisciplinary case management seminars; working in conjunction with local community coalitions, professionals, and *promotoras* to assist in community health projects; and, participation in the "Issues in Rural Health Care" course offered to students of all disciplines through the University of Arizona College of Nursing.

The NCNS project's organizational framework provides the means through which the project's objectives can be fulfilled. The following objectives have been outlined by the NCNS principal investigators (PIs)

> (1) "Provide interdisciplinary case management services to high risk populations;
> (2) Increase collaboration between rural practitioner and university faculty and students;
> (3) Trains students in a collaborative interdisciplinary model for creating culturally relevant community based interventions;
> (4) Increase the number of health sciences faculty with experience in rural health care and interdisciplinary teamwork" (NCNS, 2003).

The PIs of NCNS, Dr. Marion Slack of the UA College of Pharmacy and Dr. Marylyn McEwen of the UA College of Nursing, are directly responsible for the grantsmanship, funding allocations, and routine operations of the project.

Through their efforts the PIs have coordinated with several Nogales-based community outreach programs to create weekly interdisciplinary case management seminars. These seminars take place at the Southeast Arizona Health Education Center (SEAHEC, Dir. Karen Halverson) and constitute the primary educational and training aspects of the NCNS. The seminars are attended by *promotoras* from *Placticamos Salud*, the nursing director of the Mariposa Community Health Center, a nurse practitioner who specializes in diabetes care, the PIs, and the students.

The *promotoras* are trained independently of the NCNS program through another grant program sponsored by HRSA known as *Placticamos Salud* (lit. "Let's talk about health"). The *promotoras* are specially trained in diabetes community management and education and serve as the cultural liaisons between NCNS's clients and students. The *promotoras* are an essential link to the community of Nogales, AZ and the resources available to students for assisting their clients.

B. ADHS, Office of Border Health

The Office of Border Health (OBH) is a division of the ADHS. The mission of OBH is to "promote and protect the health of all border area residents through sound, competent public health practices along the Arizona-Sonora border" (ADHS, 2003). Additional objectives include coordination and integration of public health programs to identify, monitor, control, and prevent adverse health events in border communities and strengthen "cross-border public health collaboration with Sonora, Mexico" (ADHS, 2003).

The organization framework of the Office of Border Health and its collaborators provides the ability to tackle the often complex cross-border issues facing Arizona and Sonora. The Office of Border Health is directed by Dr. Cecilia Rosales, and is overseen by Dr. Katherine Eden, director of ADHS. The OBH oversees several border health projects, studies, and community outreach activities. Current OBH projects include the Border Infectious Disease Surveillance project, the Binational Tuberculosis project, Healthy *Gente* 2010, and the US-Mexico Border Diabetes project. Current OBH studies include the US-

Mexico border pediatric lead assessment, development of Sonora-Arizona health indicators, and HPV/STD prevalence along the Arizona-Sonora border. The OBH is involved in community outreach through representation in the Binational Health Council and the US-Mexico Border Health Commission (USMHC). Drs. Katherine Eden and Cecilia Rosales represent Arizona within the USMHC. Additionally, the OBH has several collaborators at the binational, federal, state, and local levels including the Pan-American Health Organization, *la Secretaria de Salud Publica de Sonora*, the Centers for Disease Control and Prevention, the Environmental Protection Agency, Arizona Department of Environmental Quality, Arizona Department of Agriculture, and SEAHEC. In addition, OBH collaborates directly with the Sonora-Arizona Border Public Health Office (SAHO, Dir: Dr. Mercedes Gameros) located in Nogales, Sonora and the *Secretaria de Salud Publica de Sonora* (SSA, Dir: Dr. Jorge Ochoa Cruz) located in Hermosillo, Sonora which provides direct oversight of the *Hospital General de Nogales, Sonora* (Dir: Dr. Enrique Davis).

Through intensive collaborative efforts between OBH and its affiliates, the development of the *Centro de Estabilizacion Medica de Nogales, Sonora* was made possible. Additionally, primary data collection and data infrastructure development efforts through the *Hospital General de Nogales* and SAHO with the assistance of the *Colegio de Sonora* and the University of Arizona provide a multitude of trackable data essential to the development and evaluation of the *Centro* project.

IV. PROJECT DESCRIPTION

The diabetes case management portion and the community health portion of this two-part internship with *Nuestra Communidad, Nuestra Salud* will be described separately.

A. *Centro de Estabilizacion Medica de Nogales, Sonora* Project

In January 2001, the Arizona-Sonora Healthy *Gente* (lit. "People") 2010 Summit convened to establish goals and priority actions for the future health of the Arizona-Sonora border. Following the development of 25 border health priorities, the number one consensus priority was the improvement of healthcare infrastructure and communication along the Arizona-Sonora border. A steering and planning board, known as the Binational Advisory Board (BAB), was formed to oversee the implementation of programs to tackle this priority. This board addressed the need to upgrade services provided to border residents and ensure prudent utilization of existing limited resources available at the Nogales border. The culmination of the strategic planning phase for the BAB was the development of the Triage and Stabilization Unit, later renamed *Centro de Estabilizacion Medica de Nogales, Sonora* (lit. "Medical Stabilization Center of Nogales, Sonora").

The overall goal of the *Centro* project is to increase the access to quality emergency care for Nogales, Sonora. Other goals include improving the facility at which the unit is housed by increasing the quantity and quality of resources and personnel available as well as improving the perception and awareness of emergency care within the Nogales, Sonora community. With the inception of the unit, greater numbers of emergency cases can be treated locally thereby reducing the Nogales, Sonora reliance on Nogales, Arizona and Tucson medical facilities for emergency care.

This internship involved development of an evaluation model to assess the impact of the unit on emergency health care services, perceptions, and costs for the Nogales, Sonora and southern Arizona communities. For the entire description and evaluation model developed for this project please refer to *Appendix C.*

B. Diabetes Case Management with *Nuestra Communidad, Nuestra Salud*

Working with NCNS provides the opportunity to work in collaboration with students from multiple disciplines including medicine, public health, pharmacy, social work, nursing, and nutrition. The interdisciplinary team works in conjunction with *promotoras* (community health workers) from the *Placticamos Salud* project of the Mariposa Community Health Center. The target population served by NCNS is diagnosed with or at risk for diabetics. Students are provided orientation in the Omaha system of case management as well as educational background in interdisciplinary teamwork concepts, *promotora* and cultural concepts, immigration and welfare policy, rural border health issues, and diabetes through a series of educational modules and discussions.

The interdisciplinary team met every Thursday from 1130a-130p to discuss the individual cases and collaborate in an interdisciplinary style to facilitate the case management. In addition, the team visited local public health, social, and community agencies to increase their awareness of the resources available within Nogales, Arizona. A windshield survey of Nogales was performed as well as a border crossing into Nogales, Sonora to tour the various health facilities, government buildings, and *maquiladoras* on the Mexican border to facilitate a greater understanding of the environmental, social, economic, political, and cultural issues which impact rural border health care.

Students utilize a case management model to identify, direct, and coordinate resources for their diabetic clients. The Omaha system of case management serves as the tracking system for all encounters of students with their clients (Martin, 1992). Through use of the Omaha system, students develop a database for each client which ultimately provides the foundation upon which interventions can be enacted to benefit and/or educate their clients. Interventions utilize community resources to provide for the client. Each student carries between 1 - 4 clients ranging in ages from early childhood to elderly depending on which age range the student wishes to work with. The assistance of a *promotora* at each encounter and intervention assures appropriate cultural competency with Hispanic clientele.

V. PERFORMANCE ACTIVITIES

A. *Centro de Estabilizacion Medica* activities

For a full description of project-specific activities please see full project and evaluation report found in ***Appendix C.***

B. Diabetes Case Management with NCNS

My case management client was a 12-year-old Hispanic male, BG, who is a Nogales, AZ native. BG was diagnosed with Type I diabetes mellitus (DM) at the age of 5. BG's family is originally from the Mexican side of the border, making BG a first-generation native of the US. BG has a long history of uncontrolled Type I DM as well as Attention Deficit Hyperactivity Disorder (ADHD) and Oppositional Defiant Disorder (ODD). BG has trouble in school and at home and frequently disregards self-care aspects of DM.

BG's family situation is a large contributor to his problems. BG lives with his mother and grandmother (Spanish-speaking only) and grandfather who is a trucker who is frequently absent. BG has no definitive father figure or male presence in his life and has a long history of disrespect towards family, educators, and authority figures. This disregard and disrespect for others ultimately has translated into disrespect for himself leading to repeat hospitalizations for diabetic ketoacidosis and suspensions from school for fighting and inappropriate behavior. The mother and grandmother, upon first encounter, showed little interest in helping with BG stating that he will always be trouble and will listen to no one.

Through a series of encounters, with the assistance of Gwen Gallegos, diabetic specialist and nurse practitioner, and case presentations with the interdisciplinary team, BG was provided renewed guidance in his DM self-care as well as encouragement to develop self-esteem and respect for others. Initial encounters took place at BG's residence with his mother and grandmother. At this time, the importance of family assistance and encouragement of self-care were discussed. Additionally, we discussed establishment of boundaries and a positive conditioning reward system for good self-care and behavior at school. The next several meetings consisted of DM education and demonstration of self-care techniques including finger-stick blood glucose monitoring and insulin prep and injection. We played a series of DM educational

games provided by the Juvenile Diabetes Research Foundation and American Diabetes Association to stimulate BG's interest in the self-care of and symptomatology of DM. Additionally, BG's pediatrician and pediatric endocrinologist were contacted, and his case was discussed with them. This led to medication adjustments (for both insulin and Ritalin), dietary counseling, and renewed mental health counseling at the Southeast Arizona Behavioral Health Service (SEABHS). Finally, BG's school principal, counselor, and teachers provided information regarding his school behaviors, which were, in turn, discussed with BG and his family in several encounters.

The use of the interdisciplinary approach to BG's case management involved individual, family, and community interventions to identify and coordinate resources to provide full-range care for BG. Medical, community, and school resources were directed and coordinated to provide BG with the means necessary to improve his DM self-care and behavioral problems. Upon last contact with BG's family and school following completion of my internship, BG's blood glucose levels, school and at home behavior, and interpersonal relations have all significantly improved.

C. Objectives Performance

The breakdown of objectives for the two portions of this internship as well as the overall objectives provided a framework upon which I could meet the overarching goal of my internship (stated previously in section II-A). Based upon the limited amount of time available for completion of the internship, not all objectives could be adequately met. The objectives accomplished through this internship were deemed the most important to the furthering of my understanding of rural border health issues.

Diabetes case management objectives were easily met. Participation in the interdisciplinary team provided a greater understanding of how this model of team-based approach to case management could best provide for the needs of the clients. I now have a greater appreciation of the contributions that the various healthcare disciplines make to the overall care of the client, specifically for the diabetic population. Working in conjunction with *promotoras*, provided an in-depth view into the sociocultural and environmental issues which influence resource allocation and healthcare behaviors with the community of Nogales, AZ. Since resources in the community were scarce, having the knowledge of the *promotoras*, nurses, and social workers familiar with the available resources afforded the most efficient identification,

procurement, and allocation of resources to the clients. Participation in facility tours and interviews with directors of a variety of community agencies including SEABHS, Child Protective Services, Nogales School District, and the Santa Cruz County Public Health Department provided great insight into the resources available with the Nogales community for diabetic individuals.

The objectives for the community health component of this internship were more difficult to meet. Due to the vast range of organizations involved in the *Centro* project and the limited time frame during which this internship was performed, in-depth analysis of all organizations involved in the project was limited. Direct involvement with the ADHS Office of Border Health, the USMBHC, the *Secretaria de Salud Publica de Sonora*, and the project's Binational Advisory Board offered great insight into the current atmosphere and working relations (institutional, governmental, and individual) between the states of Arizona and Sonora. The economic development of the US-Mexico border at Nogales and its impact on the healthcare of the region are discussed in detail with the final *Centro* project report found in ***Appendix C***. Needs assessment and baseline data collection were accomplished and are discussed in the final project report.

The broad overall objectives for this internship define what could ultimately be turned into a lifelong career of exploration into the complexities of the US-Mexico border and border health issues. The social, political, and economic aspects of border health, I found, were entangled within all facets of the both portions of this internship. The political and financial constraints placed upon healthcare on the US-Mexico border definitely outweigh the social pressures placed on the US and Mexico governments to provide appropriate healthcare to their respective populations. The increase in economic proliferation and the ensuing population surge along the US-Mexico border will ultimately (hopefully) significantly impact the balance between these two sides, thereby leading to a more humane and socially acceptable level of care to the populations on both sides of the border.

VI. PROBLEMS and SOLUTIONS

1. The Cultural Barrier

I faced a "Cultural Barrier" during my internship on both sides of the border. As a Caucasian, or "gringo," I was frequently perceived to be lacking in cultural competency in Hispanic and Mexican custom as well as the Spanish language. Through diligent use of Spanish language audio learning tapes I played in my car during the daily two and one-half hour round-trip commute to and from Nogales, I was able to enhance my proficiency in Spanish. But, I quickly learned that speaking the language is merely one small component to the true understanding of the culture found at the border. Twice weekly trips across the border and direct interaction with Mexican patients, hospital staff, and governmental officials provided direct insight into the workings of the Mexican healthcare industry. Additionally, visiting a variety of sites within the city of Nogales as well as several *colonias* provided direct insight into the social, economic, and environmental issues facing this population.

2. Definition and integration of data needs, data sources, data collection, and evaluation processes.

The development of an appropriate data tracking system for the *Centro* project was necessary to provide appropriate statistical data for future analysis and evaluation of the project. The current data system maintained by the *Hospital General* was manually entered and compiled from daily logs on a monthly basis. The manual system was prone to error and was unreliable as a source for accurate data for this project. The solution to the problem was the development of a computerized data tracking system established at the Sonora-Arizona Border Public Health Office in Nogales, Sonora. Project specific demographic, cost, and epidemiological data are directly compiled through this new system and will provide prompt data extraction, analysis, and summary reporting for future evaluation efforts.

3. Evaluation methodology.

A considerable portion of my internship involved development of an evaluation model for the *Centro* project. Though I had taken a foundational class in project development and evaluation through the College of Public Health, I still felt greatly inexperienced to tackle a project of this magnitude. I was able

to enhance my knowledge of healthcare/public health evaluation methodology through use of the following texts: (1) Grembowski, The Practice of Health Program Evaluation;

(2) The Sage Publications Evaluation Kit:

a. Herman, Evaluator's Handbook,
b. Fitz-Gibbons, How to Design a Program Evaluation,
c. Fitz-Gibbons, How to Analyze Data,
d. Patton, How to Use Qualitative Methods in Evaluation,
e. Morris, How to Communicate Evaluation Findings,
f. Stecher, How to Focus an Evaluation,
g. King, How to Assess Program Implementation
h. Henerson, How to Measure Attitudes

(3) W.K. Kellogg Foundation's Logic Model Theory of Evaluation (http://www.wkkf.org).

Additionally, support for my evaluation planning and model development was provided through the Rural Health Office of the UA College of Public Health from Jill de Zapien and Maia Ingram.

VII. INTERNSHIP EVALUATION

Ascertainment of the internship position with *Nuestra Communidad, Nuestra Salud* was straightforward. Contacts with Drs. Slack and McEwen, the principal investigators of the HRSA grant through which NCNS is funded, was established to define my expectations of the internship and provide further contact regarding the community health component. After discussions about the case management component, Dr. Slack was able to provide the name of Dr. Cecilia Rosales, director of the ADHS Office of Border Health and then president of the US-Mexico Border Health Association.

At my subsequent contact with Dr. Rosales, we discussed the *Centro* project in some detail as well as the role I would play in the development of the project and its evaluation. I was initially very confused about my role expectations as well as the major players involved in the project. Several further discussions with Dr. Rosales and a few members of the Binational Advisory Board provided greater insight into my role as well as the foundations upon which the project was developed.

The developmental stages of the *Centro* project appeared to be occurring in a slow, piece-meal fashion. I was disappointed with the project's lack of needs assessment as well as lack of appropriate data and data sources upon which I could develop an appropriate evaluation model. Dr. Rosales and the other members of the Binational Advisory Board were unable to provide any expertise or initial direction in the planning and development of the evaluation model. None of the members could provide ideas regarding what types of evaluation questions they would like answered nor could they define the expectations of the evaluation. I felt as though the evaluation was added to the project merely as a technicality. This tended to leave me feeling that my internship position was merely of minute significance in the grand scheme of the project. I felt it necessary to discuss with the board the importance of evaluation of today's public health projects in light of acquiring appropriate funding sources and overall assessment of the impact of the project on the community. All members concurred that these aspects were essential to the long-term funding and longevity of the project.

Supporting documentation for this project was mainly business affidavits and previous planning documents for another project established in Agua Prieta, Sonora known as the "*NeoVida* – Agua Prieta" project. This project, though noted to be highly successful in the care for neonates in northern Sonora, was lacking an evaluation component. Without an appropriate and methodologically defined evaluation model,

this project's success could only be demonstrated through word-of-mouth and anecdotal evidence provided by the project's directors and planners. No data gathering or data tracking systems had been implemented, and the project's true impact on the provision of neonatal care within the community could not be objectively documented. The need for an evaluation plan as well as the need to document the planning, development, and implementation stages of this unique border project were necessary actions that needed to be taken for this project to be truly noteworthy of success. Because the *Centro* project was based upon the apparent "success" of the *NeoVida* project, the lack of objective documentation of the latter's success ultimately hindered the former project's foundational rationale and funding source recruitment.

The diversity of agencies involved in the project had several significant advantages and disadvantages. Overall, this project's development was hindered by the lack of insight into the long-term goals and impacts of the project by the project developers. The complex association of partnerships established in the planning stages of the project, founded during the development of the Healthy *Gente* 2010 project meetings, initially led to confusion regarding the leadership of the project. Though the project shared a common goal of improved healthcare infrastructure along the Arizona-Sonora border amongst all players involved in its planning stages, centralized long-term and short-term goals had not been appropriately defined. This can be attributed to the diversity of opinions found amongst the stakeholders of the project. It became essential to establish a commonality in project theme, output, and outcome before the project could move forward and an appropriate model of evaluation could be established. Unfortunately, development of this consensus was hindered by differences in political motivations from the governmental agencies and other major players involved in the project as well as border-specific complications (eg. customs protocols for movement of healthcare supplies/equipment cross border). Therefore, a large majority of the initial part of my internship involved defining and working through these political motivations and agendas and establishing a common set of short- and long-term expectations for the project.

Though the complex relations involved in the project were often detrimental to its progress, I do believe that without these same relations, this project would not be possible. First, because of the firm associations already established between the governments of Arizona and Sonora through such agencies as the Arizona-Mexico Council and Binational Health Council, the binational support and relations necessary

for development and implementation of this type of cross-border binational project were already in place. The strength of these cross-border relations between Arizona and Sonora are noted to serve as a role model for the other US and Mexican border states. Secondly, the vast experience in binational healthcare affairs of the members of the Binational Advisory Board provided a foundational commonality in the understanding of the cultural, political, economic, and societal influences affecting the project. Finally, direct communications amongst board members from both Mexico and the US was facilitated by the sharing of a common language, Spanish, by the board members. This commonality in language was a simple yet effective means in consolidating solidarity and consensus among the diversity of board members.

Through my internship experience with the *Centro* project, I gained an important understanding of the primacy of consensus of opinion and its effect on the pre-planning, planning, and development stages of a public health project. Development of consensus goals, objectives, and impact statements for a project during its planning stage is the essential aspect in driving the remainder of the project development. Without this consensus foundation, the remainder of the project, including implementation, evaluation, and redesign phases, often flounders leading to loss of support amongst stakeholders, loss of financial backing, and potential dissolution of the project. With the *Centro* project, development of these consensus goals and objectives should have been the initial step taken in the planning phase. From this foundation, the timeline for project development as well as the establishment of the infrastructure necessary to establish its potential success are facilitated.

The exposure to the Mexican healthcare system as well as the diversity of organizations from both sides of the border dramatically enhanced my knowledge of US-Mexico border health issues. Having only previously been in contact with the US healthcare system and its governance, the added insight into how another country approaches healthcare provision for its population has broadened my perspectives on healthcare delivery. Though neither system is perfect, the Mexican system of healthcare most readily treats healthcare as a right and less as a privilege, as is often the case in the US. All members of the Mexican population are provided access to healthcare and are never denied services based upon lack of insurance or finances. Though the Mexican system is a tiered approach and may be perceived as unequal allocation of resources, the fact remains that all citizens are provided some access to basic care.

I would highly recommend participation in the *Nuestra Communidad, Nuestra Salud* project for any public health students who have an active interest in border health issues. The multiple aspects of my internship provided a profound learning environment. From the diabetes case management component I enhanced my knowledge of diabetes, *promotoras,* case management, community resource acquisition, and interdisciplinary treatment planning. Through my work with the *Centro de Estabilizacion Medica* project I was afforded unique exposure to cross-border relations, evaluation methodology, project development skills, and healthcare infrastructure development in a rural/border community. The internship met and far exceeded my expectations.

As a final thought to the experience of this internship: I have come to believe that the free-flow of culture, people, trade, and society-at-large through the porous boundary of the US-Mexico border is what truly defines this region. The shared language and culture makes this population unique. Therefore, the future of border health must be developed collaboratively by the US and Mexican governments with this uniqueness in mind.

VIII. REFERENCES

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IX. APPENDICES

APPENDIX A:

Original Internship Goals, Objectives, and Activities

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Re: Internship Learning Objectives and Activities

INTERNSHIP GOAL: Enhance my understanding of the medical and public health issues of rural US-Mexico border health care through participation with Nuestra Communidad, Nuestra Salud.

LEARING OBJECTIVES

I. Interdisciplinary Case Management Team Component
   a. Describe the concepts and framework of an interdisciplinary team approach to case management and its advantages for practice in rural areas.
   b. Participate in an interdisciplinary team and describe the contributions which various disciplines provide to the overall function of the team.
   c. Describe role of community health workers (*promotoras)* in context of case management.
   d. Provide case management for diabetic individual(s) within the Nogales, AZ community using the Omaha system model.
   e. Identify the availability and accessibility of resources, and lack there of, for diabetic individuals within the Nogales community.

II. Community Health Component
   a. Work in collaboration with the ADHS Office of Border Health; Binational Health Council; US-Mexico Border Health Commission; AZ-Mexico Border Health Commission; and, Secretaria de Salud of Sonora, Mexico as well as TMC, UMC, and Holy Cross hospitals in development of a stabilization and triage unit in Nogales, Sonora.
   b. Describe the structure and function of the binational agencies involved in the development of the unit.
   c. Describe the CANAMEX corridor and its potential impact on the economy and health care of the Ambos Nogales community.
   d. Describe the background and needs assessment for establishment of the unit to provide a baseline for future assessments of the impact of the unit. This will be accomplished through quantitative and qualitative data gathering strategies.
   e. Participate as a member of an evaluation team to produce measurable objectives for the evaluation model of the unit.

III. Overall
   a. Demonstrate how social, political, economic, and historical factors impact the health of a rural border community and the individuals living within it.
   b. Recognize the cultural influences on and barriers to health care in the Ambos Nogales community.
   c. Enhance my proficiency and fluency in the Spanish language.

INTERNSHIP ACTIVITIES

The overall goal of the *Nuestra Communidad, Nuestra Salud* (NCNS) project is to increase the training, recruitment, and retention of health care professionals who have the relevant knowledge and skills for practice in rural communities. Participation within the project involves two components: 1) the interdisciplinary case management training program, and 2) community health work. This two-component framework provides a unique opportunity to become indoctrinated into the various aspects of rural border health care.

The first component provides the opportunity to work in collaboration with students from multiple disciplines including medicine, public health, pharmacy, social work, nursing, and nutrition. The interdisciplinary team works in conjunction with *promotores* (community health workers) from the *Placticamos Salud* project of the Mariposa Community Health Center. The target population served by

NCNS is diagnosed or at-risk diabetics. Each student member of the team chooses 1-4 individual cases and works in collaboration with the promotora to provide full case management during the duration of the participation in the interdisciplinary team. Students are provided orientation in the Omaha system of case management as well as educational background in interdisciplinary teamwork concepts, promotora and culture concepts, immigration and welfare policy, rural border health issues, community as partner concepts, and diabetes through a series of educational modules and discussions. This team meets every Thursday from 1130a-130p to discuss the individual cases and collaborate in an interdisciplinary style to facilitate the case management. In addition, students are expected to visit local public health, social, and community agencies to increase their awareness of the resources available to them for their clients. A windshield survey of Nogales is performed as well as a border crossing into Nogales, Sonora to tour the various health facilities, government buildings, and *maquiladoras* on the Mexican border to facilitate a greater understanding of the environmental, social, economic, political, and cultural issues which impact rural border health care.

The second component of the NCNS practicum experience involves participation in some aspect of community health at the student's discretion. I have chosen to work with Dr. Cecilia Rosales of the ADHS Office of Border Health. Her current project involves the development of a stabilization and triage unit with the *Hospital General de Nogales*. The unit was conceptualized and developed through a series of discussions with a large binational coalition of organizations including ADHS, Secretaria de Salud of Sonora, US-Mexico Border Health Commission and the *Healthy Gente 2010* project, AZ-Mexico Border Health Commission, the Binational Health Council, TMC, UMC, and Holy Cross hospitals. All of these agencies have provided monies or in-kind donations of staff time and equipment to aid in the development of the unit. The overall goal of the project is to increase the access to quality emergency care for Nogales, Sonora. Other goals include improving the facility at which the unit is housed by increasing the quantity and quality of resources and personnel available as well as improving the perception and awareness of emergency care within the Nogales, Sonora community. With the inception of the unit, greater numbers of emergency cases can be treated locally thereby reducing the Nogales, Sonora reliance on Nogales, Arizona and Tucson medical facilities for emergency care. My involvement with the project will consist of collaborating with an evaluation team to develop an evaluation model to assess the impact of the unit on emergency health care services, perceptions, and costs for the Nogales, Sonora and southern Arizona communities. My first task will be to construct a picture of the emergency services provided by UMC, TMC, St. Mary's, and Holy Cross to Mexican nationals including types of cases, services provided, and costs. Also, the Sonoran state epidemiologist will be contacted to determine the numbers and types of emergency cases seen within the Hospital General. In addition, I will conduct qualitative interviews to assess the current impressions of the emergency services provided to the Nogales, Sonora community at present. These interviews will be conducted with health care practitioners within the Nogales, Sonora community as well as with Mexican patients who have received emergency medical services from Arizona health care facilities. Possibly, a patient satisfaction survey will be developed and used within the Nogales, Sonora medical community to assess the level of awareness and perceptions of the current emergency services available and to assess the perceptions of health care services available in Arizona and Hermosillo, Sonora. These data will be collected and analyzed to demonstrate the trends in types of emergency cases within Nogales, Sonora, the demographic information of the Mexican cases transported and serviced by southern Arizona health care facilities, the monetary impact these services have upon the budgets of the various Arizona health care facilities, and the current perceptions of the community and health care personnel of the emergency services available to the Nogales, Sonora community. From this data, the evaluation team and future evaluators will be able to generate measurable objectives for the evaluation model and create a baseline from which future evaluations can be conducted to assess the impact of the unit.

In addition to working with NCNS, I will be preceptoring with Dr. Eladio Pereira at the Mariposa Community Health Clinic for a half day per week. Through work with the CHC, I will gain additional valuable insight from the perspective of a physician as well as learn how the CHC is intimately related with the Santa Cruz County Health Department to provide medical and public health services to the Ambos Nogales community.

Through these various activities I hope to realize the various aspects of rural border health care. I will enhance my understanding of the binational arrangements made between Mexico and the US regarding border health issues. I also hope to gain a profound indoctrination into the culture of the Ambos Nogales community and develop a proficiency in Spanish through immersion into the culture and language.

APPENDIX B:

"Building Emergency Services Infrastructure Along the Arizona-Sonora Border: The Emergency Medicine Pilot Project of Nogales, Sonora"

Original Abstract and Oral Presentation (April 5, 2002)

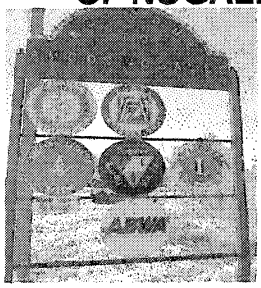
BUILDING EMERGENCY SERVICES INFRASTRUCTURE ALONG THE ARIZONA-SONORA BORDER: THE EMERGENCY MEDICINE PILOT PROJECT OF NOGALES, SONORA. **J.P. Crawford**. University of Arizona, Tucson, AZ, USA. AzGPPH advisor: Dr. L. Johnson. Site & Site Supervisor: *Nuestra Communidad, Nuestra Salud* – Dr. M. Slack.

The Emergency Medicine Pilot Project was developed to better coordinate and upgrade the emergency care available within the Sonora, Mexico border region while reducing the number critically ill persons crossing the border to seek medical care in Arizona. In doing so, the project will address issues that have resulted in Mexican nationals relying heavily on the Arizona health care system for emergency services. The project stems from a Healthy Gente 2010 coalition mandate to initiate improvement of hospital infrastructure and communication within border communities.

To achieve these goals, the project proposes to plan, implement, and evaluate the effectiveness of a new emergency services unit developed within the *Hospital General de Nogales*. To document the impact and success of this pilot project, an evaluation team was recruited to develop an evaluation model. The "logic model" approach was utilized to gather and categorize the available resources and to propose the activities and outputs necessary to meet the potential outcomes, impacts, and goals of the project. Preliminary data gathering and analysis efforts have provided the baseline frame-of-reference from which future evaluation of the project will be compared.

With the potential success of this pilot project, other border communities will be able to design similar projects based on this model. The end result will be the expansion of emergency services infrastructure along the entire US-Mexico border to meet the needs of a rapidly growing border population.

THE EMERGENCY MEDICINE PILOT PROJECT OF NOGALES, SONORA



Jason Crawford
University of Arizona
Colleges of Public Health and Medicine

Presentation Overview

- Internship Background
- Emergency Medical Pilot Project (EMPP):
  - Integrating the Logic Model
  - Planning Stage
  - Implementation Stage
  - Evaluation Stage
- Discussion
- Q & A

Presentation Overview

- **Internship Background**
- Emergency Medical Pilot Project (EMPP):
  - Integrating the Logic Model
  - Planning Stage
  - Implementation Stage
  - Evaluation Stage
- Discussion
- Q & A

Internship Oversight

- *Nuestra Communidad, Nuestra Salud*
  - Dr. Marion Slack, PhD, RPh
  - Marylyn McEwen, PhD(c), MS, RN
- ADHS, Office of Border Health
- President, US-MX Border Health Commission
  - Dr. Cecilia Rosales, MD

Internship Project

The Emergency Medicine Pilot Project

Objectives:

- Develop the evaluation component
- Gather baseline data

Project Complexities

- Lack of border health experience
- Binational complexities
  - culture shock
  - navigating the MX medical system
  - border crossing issues
- Multi-organization coalition

Presentation Overview

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Problematic Imbalance

- Adequate emergency healthcare resources
- Effective emergency transport system
- Faith in Mexican healthcare system

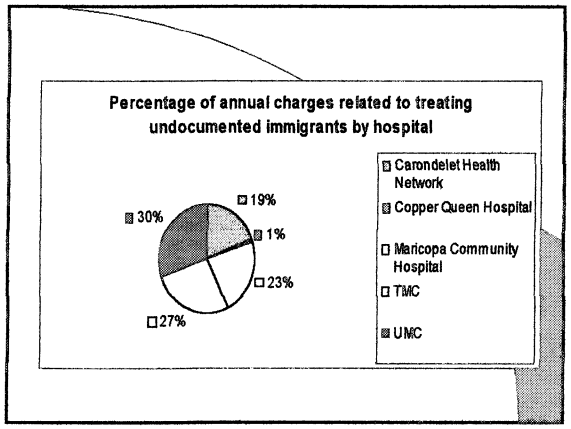
- Rapidly expanding MX border population
- US-MX border economic prosperity

Result of Problematic Imbalance

Expanding MX border population + Lack of adequate emergency care infrastructure

= Heavy reliance on AZ health care system for emergency care causing:

1) inappropriate delay in necessary care
2) increased financial burden on AZ healthcare system



ONLINE www.azstarnet.com

Arizona Daily Star

SERVING TUCSON SINCE 1877 · TUESDAY, APRIL 17, 2001

Migrants' medical costs burden providers

Arizona-Sonora Healthy Gente 2010 Initiative

- Identified and prioritized border health problems
- Priority 1: Improve hospital infrastructure and communication
- Binational Advisory Board established
- EMPP development begun

Initial Project Goal

- Development of a new trauma and stabilization unit at *Hospital General de Nogales, SO*
- Expand, upgrade, and better coordinate emergency services in Nogales, SO

Presentation Overview

- Internship Background
- **Emergency Medical Pilot Project (EMPP):**
  - Integrating the Logic Model
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  - **Implementation Stage**
  - Evaluation Stage
- Discussion
- Q & A

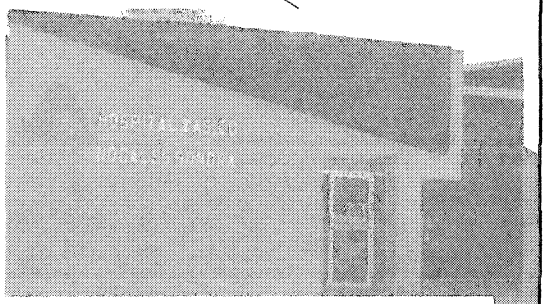
Logic Model Implementation Theory

- Resources
- Activities
- Outputs
- Outcomes
- Impacts

Logic Model: Resources

- Binational Advisory Board (BAB)
- *Neovida*-Agua Prieta Project model
- Preexisting governmental and organizational support
- Ambulance services
- Communication infrastructure

Hospital General de Nogales



Logic Model: Activities

- BAB activities
- *Secretaria de Salud* activities
- Project Coordinator activities
- Evaluation activities
- Staff training
- **Provide quality trauma/emergency care**

Logic Model: Outputs

- Amount of funding attained
- # and types of staff, equipment, and trainings provided to unit
- # of cases provided quality EMS transport to Hermosillo for definitive care
- # cases treated and amount of uncompensated costs at UMC, TMC, Holy Cross, and St. Mary's
- **# of trauma/emergency cases provided care by unit**

Logic Model: Outcomes

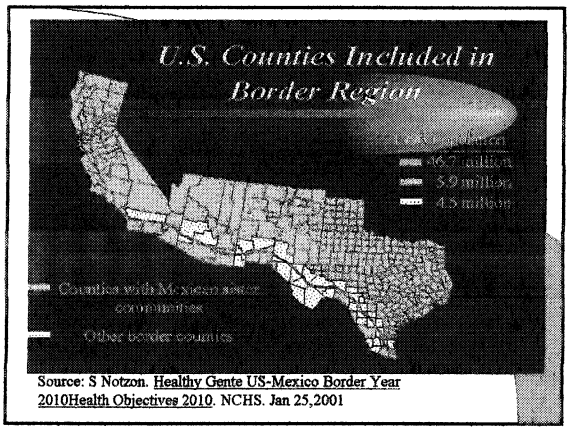
- Short-term (1-3 yrs):
  - Increased specialized staff, equipment, and training
  - Increased access to quality care
  - Increased quantity of cases treated
  - Increased community awareness
  - **Decreased uncompensated costs of care for AZ healthcare system**
  - **Decreased # trauma/emergency-related mortalities/morbidities**

Long-term (4-6 yrs)

- **Increased *patronato*** (community-support foundation)

Logic Model: Impacts

- Decreased reliance on US healthcare system
- Increased community satisfaction and perception of MX emergency services
- Decreased trauma/emergency-related mortality and morbidity incidence rates at US-MX border
- **Expansion of emergency healthcare infrastructure locally and in other border regions**



Source: S Notzon. Healthy Gente US-Mexico Border Year 2010Health Objectives 2010. NCHS. Jan 25,2001

Presentation Overview

- Internship Background
- **Emergency Medical Pilot Project (EMPP):**
  - Integrating the Logic Model
  - Planning Stage
  - Implementation Stage
  - **Evaluation Stage**
- Discussion
- Q & A

Logic Model: Evaluation Plan

- Focusing
- Determining the audience(s)
- Asking the right questions
- Assessing information use
- Establishing indicators
- Determining data sources, instruments, and technical assistance necessary

Data Gathering Difficulties

- Extracting project-specific data from existing hospital databases
- *Hospital General*: manually tracked data

Presentation Overview

- Internship Background
- Emergency Medical Pilot Project (EMPP):
  - Integrating the Logic Model
  - Planning Stage
  - Implementation Stage
  - Evaluation Stage
- **Discussion**
- Q & A

EMPP & The Logic Model

- Straightforward and efficient
- Produces visual templates
- Identifies gaps and missing components

Experience with AZ-SO Border Health

- Ambos Nogales = "both" Nogales
- interwoven cultures
- Long history of collaboration
- Sets the standard

Acknowledgements

- *Nuestra Communidad, Nuestra Salud*
- ADHS, Office of Border Health
- UA College of Public Health
- *Hospital General de Nogales, SO*
- *La Secretaria de Salud del Estado de Sonora*
- SEAHEC
- US-Mexico Border Health Commission
- Holy Cross Hospital, UMC, TMC
- Arizona Hospital Association
- Nogales Fire Department

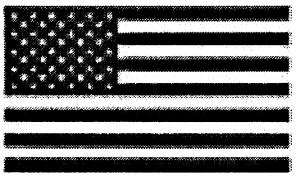
APPENDIX C:

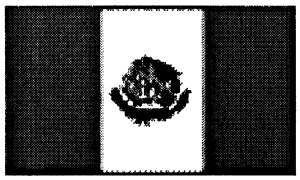
Centro de Estabilizacion Medica de Nogales, Sonora
Project and Evaluation Report

Centro de Estabilizacion Medica de Nogales, Sonora

(Medical Stabilization Center of Nogales, Sonora)

Project and Evaluation Plan Report





Jason Crawford
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June 1, 2002

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I would like to thank the following organizations and staff for their assistance in development of this report:

- ADHS, Office of Border Health – Dr. Cecilia Rosales, Nolvia Cortez
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- UA College of Public Health, Rural Health Office – Jill De Zapien, Maia Ingram
- Arizona-Mexico Border Health Commission – Ana Nevarez
- *La Oficina de Salud Publica Sonora Arizona* – Dr. Mercedes Gameros
- University Medical Center – Dr. Adolfo Felix and Barbara Felix
- Tucson Medical Center – Robert Guerrero and Dr. Jose Robles
- Carondelet Holy Cross Hospital – Rich Polheber
- *la Secretaria de Salud del Estado de Sonora*
- United States-Mexico Border Health Commission
- Arizona Hospital and Healthcare Association – Jim Haynes
- Southeast Arizona Health Education Center – Karen Halverson and staff
- Nogales Fire Department – Chiefs Dennis van Auken and Jesus Gomez, and Inspector Enrique Martinez

And of course, the assistance of Drs. Marion Slack and Marylyn McEwen of *Nuestra Communidad, Nuestra Salud* for making all this possible.

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I. Introduction

The following report provides an in-depth project review and evaluation plan for current and future evaluation efforts of the *Centro de Estabilizacion Medica* (Medical Stabilization Center) of Nogales, Sonora. The report provides the evaluation approach necessary to track the outcomes and impacts that the project will potentially have on the emergency and trauma care for the Nogales, Sonora border region.

The process of development of this evaluation plan will be considered beginning with a brief assessment of the current demographic, social, and economic state of the US-Mexico border region with a focus primarily on the effects that the rapid population expansion of the northern Mexico border has had on the healthcare infrastructure. The derivation of this project's problem statement will be provided as well as the rationale for the proposed solution.

Project planning and implementation stages have been underway since the inception of the project proposal at the Arizona-Sonora *Healthy Gente* 2010 conference held in January 2001. Planning and implementation efforts accomplished by the Binational Advisory Board are essential components to the development of the evaluation plan. It is important to note from the outset of this report that no other binational project of this kind has ever been implemented in any of the four US border states or six Mexican border states. Thorough literature review for similar projects yielded no results. Therefore, this project has set precedence not only in its vision, design, and potential impacts, but also for the future of emergency and trauma care for the US-Mexico border.

Based upon the distinctiveness of this project, development of the evaluation plan has been a complex operation. To help facilitate the process, a program planning theory known as the "Logic Model," developed by the W.K. Kellogg Foundation, was employed to provide a simple framework upon which evaluation planning could be derived. The components of the "Logic Model" will be expanded upon in the report followed by an integration of this project into the "Logic Model" theory. Through this integration, the evaluation plan for the *Centro de Estabilizacion Medica* project was derived. The focus areas, evaluation questions, data sources, and indicators of success of the project are provided within the report.

From the evaluation plan, the evaluation process and data tracking systems necessary to ensure appropriate data collection to answer the evaluation questions were developed. Integration of the evaluation plan into the framework of the project ensures a timeline upon which future evaluation and review can occur and provides for determination of accurate, reliable data from the outset of the project.

Following the description of the evaluation plan is a series of recommendations upon which the Binational Advisory Board and future evaluators of the project will need to consider for their future evaluation efforts. These recommendations provide a foundation upon which data tracking systems, outcomes assessment, and indicator development and enhancement can occur as the project matures.

The *Baseline Data* section found in *Appendix K* contains a compilation of data extracted from several sources which where used to compose this report. This baseline information will ultimately be used as a comparator for future evaluation efforts.

The appendices contain all remaining pertinent data and documents utilized in the development of the *Centro de Estabilizacion Medica de Nogales,* Sonora project and the evaluation plan.

II. Assessment of US-Mexico Border

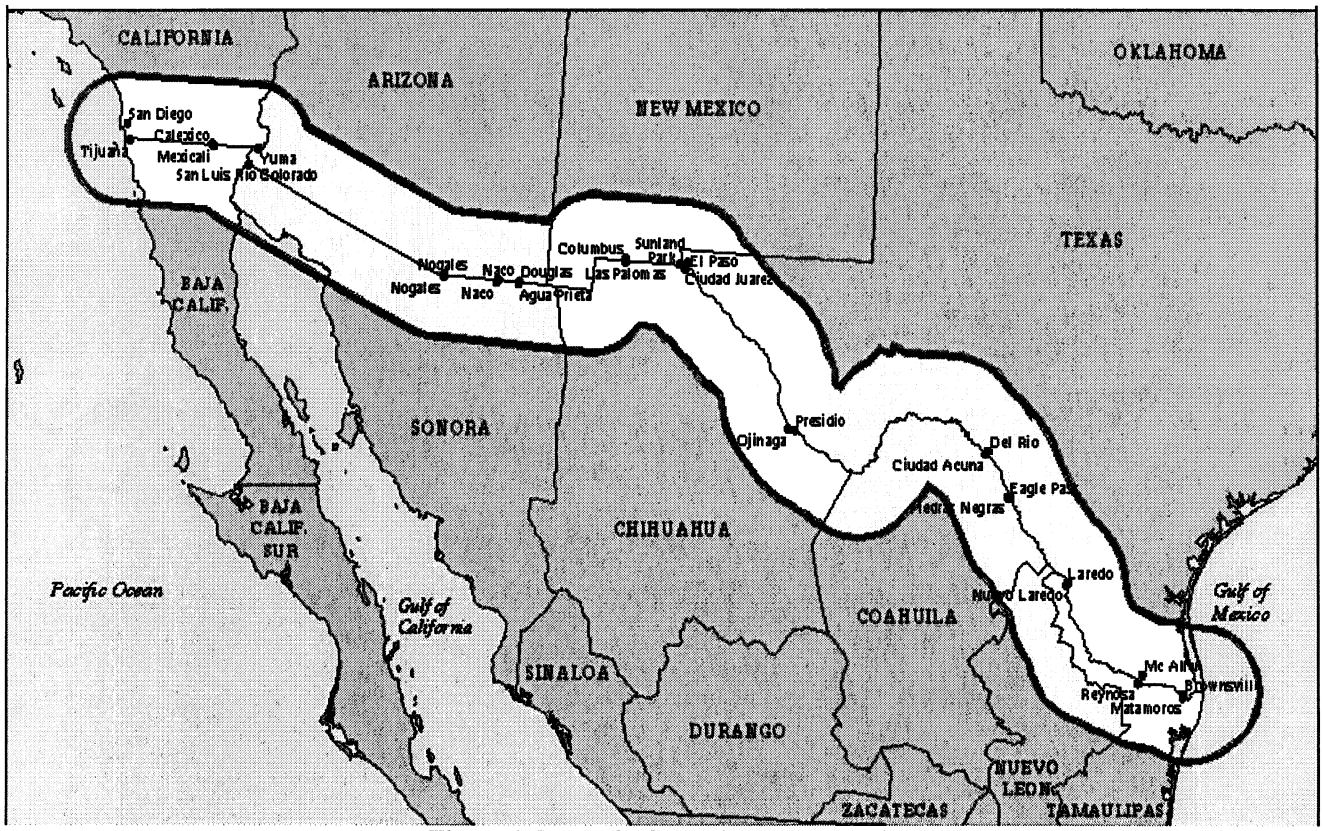

Figure 1. Map of US-Mexico border region

Figure 1 illustrates the US-Mexico border region. The border spans a 3000km distance from the Pacific Ocean to the Gulf of Mexico. Along this international boundary lie 4 US states (California, Arizona, New Mexico, and Texas) and 6 Mexican states (Baja California, Sonora, Chihuahua, Coahuila, Nuevo Leon, and Tamaulipas). The border region (outlined in brown) has been designated as 100km on either side of the international border in accordance with the La Paz Agreement of 1983. Within this region lie 39 Mexican municipalities (*municipios*), 25 US counties, and 14 pairs of sister cities, including Nogales, AZ/Nogales, Sonora.

Population estimates of the US-Mexico border region, according to 1995 population data, exceed 10.6 million people. Roughly 55% (5.8 million) live in the US with the other 45% (4.8 million) residing on the Mexican side of the border.[1] Over 90% of the population of this region reside within the major urban Centers such as San Diego, Tijuana, El Paso, Cuidad Juarez.

The northern Mexico border region has increased greater than 8-fold from 1930 to 2000. The average growth rate for border municipalities in the last decade (1990-2000)

is 3.6%--nearly double the Mexican national average. Though US average growth rates are lower at 2.7%, the rate still reflects a higher growth rate than the rest of the US.[1, 2] The area's population is expected to double by 2020, rivaling the expansion rates of the fastest-growing US states.[3] **Table 1** provides low, medium, and high population growth projections for the US and Mexican border regions as well as the border region as a whole. **Figure A-1** in *Appendix* A provides a graphical representation of this data.

	1995 Population*	2000 Population	2010 Population	2020 Population
High Projections				
Border total	10,585,265	12,376,232	17,144,395	24,099,054
U.S. subtotal	5,827,439	6,535,848	8,304,648	10,671,306
Mexican subtotal	4,757,826	5,840,384	8,839,747	13,427,748
Medium Projections				
Border total	10,585,265	12,145,349	15,397,768	19,460,216
U.S. subtotal	5,827,439	6,438,616	7,604,430	8,957,028
Mexican subtotal	4,757,826	5,706,733	7,793,338	10,503,188
Low Projections				
Border total	10,585,265	11,452,700	13,285,313	15,186,177
U.S. subtotal	5,827,439	6,146,918	6,757,453	7,333,809
Mexican subtotal	4,757,826	5,305,782	6,527,860	7,852,368

Table 1. Border County and *Municipio* Population Projections[1]

The projections vary based upon varying the levels of migration rates to the northern Mexico border region between 0 to 100% of 1995 migration rates. Noticeable in all levels of projection is the more rapid expansion of the Mexican border population in comparison to the US by the year 2020.

Economic prosperity of the Mexican border region has been the main reason for the vast migratory rates resulting in the rapid expansion of the border region. Attraction of young, able-bodied workers to this region has further resulted in increases in birth rates in the area thereby leading to even greater population increases due to natural population expansion. So, why is this region so prosperous and attractive for the Mexican population?

The answer to this question lies largely in the growth of the *maquiladora* program. This program, begun in the mid-1960s, "promotes the establishment of Mexican subsidiaries of foreign—mostly US—firms" close to the US border to exploit the "proximity to the US transport grid and markets."[3] This industry grew significantly during the *peso* devaluation in the 1980s due to lowered salaries and labor costs for product assembly on the Mexican side of the border and again during the 1994 North American Free Trade Agreement (NAFTA) inception and 1995 *peso* devaluation.[1] The program has grown from 2100 plants in operation in 1990 to more than 4000 in 1998, employing greater than 800,000 employees along the northern Mexico border. **Figures A-2** and **A-3** in *Appendix* A provide graphical representations of the expansion of the *maquiladoras* and employees from 1993-1999.

The attraction to the northern municipalities of Mexico appears to be due to the presence of these *maquiladoras* within these border regions. Indeed, the Migration to the Mexican Northern Border study conducted by the National Council on Population, the Office of the Secretary of Labor, and *El Colegio de la Frontera Norte* surveyed migrants and found that those looking for work in the northern municipalities increased from 55.7% to 64.1% from March 1993 to July 1999.[4] The *maquiladora* industry has decreased unemployment rates and has provided jobs with wages among the highest in Mexico. Though these wages are high, the minimum wage in Mexico remains approximately 8 to 10 times lower than that of the US.

The rapid economic expansion and resultant population explosion of the northern Mexico border region due to the migratory draw of the *maquiladora* industry has created several negative consequences for this region. Most importantly is the creation of an imbalance between an ever-increasing Mexican border population and the availability of basic services (eg. sewage disposal, water treatment, electricity) and regional infrastructure to meet the needs of the population.

One of the most significant impacts of this imbalance between population and infrastructure lies in the healthcare sector. According to several sources, health conditions and natural resources are rapidly deteriorating.[1,2,3,4,5] The following statement appears in a report developed by the United States Environmental Protection Agency (EPA) regarding the current environment of the US-Mexico border area: "While economic growth has contributed to employment, the region's infrastructure has not kept pace. As a result, human health and ecological systems are being strained by the influx of people and industrial facilities."[3] The report further states, "The border's health conditions and risks, in fact, are among the most troubling and the most serious in the United States" and Mexico.[3] The report concludes, "The area—which has never enjoyed the health quality most Americans take for granted—simply does not have the human and physical infrastructure or material wealth to keep up with the influx of new residents and factories."[3]

With this background on the current state of the northern Mexico border region and its incumbent lack of infrastructure, we can now focus attention upon the Arizona-Sonora portion of the US-Mexico border, and more specifically on Nogales, Sonora.

Though the Arizona-Sonora border region contains a smaller overall percentage of the border population, this region has experienced concurrent rapid population expansion similar to other border regions. **Table 2** provides population data demonstrating the rapid population explosion that has occurred within the Arizona-Sonora sister cities communities. The region has expanded in population by 61% over the last 15 years from 270,300 in 1980 to 442,770 in 1995. Of special interest is the Nogales, Sonora population increase from 68,000 in 1985 to 133,500 in 1995. The population in this city has doubled in the last 15 years. The year 2000 population of Nogales, Sonora is approximately 160,000, with an annual population growth rate of 4.74%, which is well above the previously stated average growth rate of the border in general of 3.6%.[6] At this growth rate, Nogales, Sonora population is expected to reach

roughly 244,000 by 2010.[6] For comparison with other Mexican border municipalities, see **Figure A-4** in *Appendix* A.

Population Center	1980 Population	1990 Population	1995 Population
Yuma, Arizona	42,000	55,000	60,000
San Luis Rio Colorado, Sonora	93,000	112,000	133,000
Nogales, Arizona	15,700	19,500	20,700
Nogales, Sonora	68,000	107,000	133,500
Douglas, Arizona	12,800	13,000	14,800
Agua Prieta, Sonora	34,400	39,000	56,000
Naco, Arizona	Not Available	700	870
Naco, Sonora	4,400	4,600	4,900
Tohono O'Odham Nation	Not Available	17,300	19,000
Total	**270,300**	**368,100**	**442,770**

Table 2. Arizona-Sonora Border Region Populations, 1980,1990, 1995[5]

Maquiladora industry presence is Nogales, Sonora is highly apparent. Seven industrial parks and greater than 90 *maquiladoras* exist within the Nogales region and employ roughly 40,000 of the current 160,000 people.[7] On the other side of the border, Nogales, Arizona is one of the largest *maquiladora* sites in the US.[8]

Formation of the CANAMEX (*CAN*ada-*A*merica-*MEX*ico) trade corridor will result in even further expansion of the *maquiladora* industry and population in Nogales, Sonora. Designated by the US Congress in the National Highway Systems Designation Act of 1993, the CANAMEX corridor will establish a continuous four-lane highway from Mexico City to Edmonton, Alberta with the port of entry between the US and Mexico in Nogales (see **Figure 2**). This port of entry, Arizona's largest accounting for two-thirds of all commercial traffic entering Arizona from Mexico, is already trafficked by greater than 180,000 trucks per year.[8] The increase in trade and commerce along this route will continue to increase the truck traffic within this region leading to further exacerbation of the already high incidence of motor vehicle accidents (MVAs) occurring in the region, which account for 28.1% of the deaths due to external cause from 1995-1997.[9]

Figure 2. Map of CANAMEX trade corridor route

As with other regions of the US-Mexico border, Nogales, Sonora also suffers from lack of basic services and inadequate infrastructure to meet the demands of the rapidly increasing population. For example, currently only 85% of the population has access to water services and of those only 39% have 24 hours per day water access.[10]

In addition to the lack of basic services, inadequate emergency and trauma healthcare infrastructure has plagued the Nogales, Sonora region. Though the city contains 15 hospitals, 3 ambulance services, and over 300 medical professionals, the emergency and trauma healthcare infrastructure within the city is inadequately established, poorly coordinated, and negatively perceived by the local population. The combined lack of level I trauma care, advanced technological equipment, and trained emergency/trauma specialists (including physicians, nurses, and technicians) has placed Nogales, Sonora in a situation of not being able to appropriately stabilize and treat high level emergency and trauma patients. And, as the population continues to expand at exponential rates, this situation has begun to achieve a critical state.

III. Problem Statement

Due to the inadequacy of local emergency and trauma service infrastructure, injured and acutely ill persons from Nogales, Sonora must often receive necessary stabilizing emergency and/or trauma care in other locations. These locations are most often Hermosillo, SO; Nogales, AZ; or, Tucson, AZ. Located within Hermosillo, the capital of the Mexican state of Sonora, and Tucson are level I trauma Centers readily equipped with level I emergency/trauma personnel and equipment to provide definitive care for high-level trauma and emergency victims.

When faced with a high-level trauma or emergency situation in which the hospitals of Nogales, SO can not appropriately provide the necessary stabilizing care due to lack of availability of resources, technology, or personnel, the patient(s) are most often transported across the US-Mexico border to Carondelet Holy Cross Hospital in Nogales, AZ. Due to its closer proximity and ultimate accessibility to definitive care at level I Centers in Tucson, AZ, including but not limited to Tucson Medical Center (TMC) and University Medical Center (UMC), a large proportion of injured and acutely ill Mexican nationals are transported across the border to Holy Cross Hospital instead of traveling to Hermosillo for definitive care.* The informal protocol developed for cross-border patient transport between Nogales, AZ and Nogales, SO by Nogales Fire Department, *Cruz Roja*, and Carondelet Holy Cross Hospital is provided in *Appendix B.*

The consequences of this heavy reliance upon the Arizona healthcare system have several negative impacts on the emergency/trauma healthcare for the Mexican population of Nogales, Sonora and the US healthcare system. Considering the acuity of trauma and emergency healthcare needs and the "golden hour" rule-of-thumb, the complexity of cross-border transport of trauma/emergency patients can lead to unnecessary delays in care ultimately leading to negative outcomes such as increased morbidity and mortality. Availability of transport vehicles, communication difficulties, INS regulations, and border traffic congestion all enhance the potential for delay of initial care. According to sources at the Nogales Fire Department, cross-border transport can take longer than two to three hours from trauma or emergency incident to initiation of care at Holy Cross Hospital. Since stabilization is essential in the care of high-level trauma and emergency patients, these delays can dramatically affect the outcomes of the case. Similar delays can occur for United States citizens touring, conducting business, or visiting family in Mexico who require cross-border transport for care in the United States.

In addition to health-related concerns, several financial concerns exist as well. The ability to provide cross-border transport requires extensive manpower and time by the many agencies involved in coordinating the transport. Nogales Fire Department must provide the emergency medical technicians and transport vehicles to facilitate the

* For reference, Nogales, AZ and Tucson are approximately 5 miles and 80 miles, respectively, from Nogales, SO, while Hermosillo is a distance of approximately 150 miles away. Not surprisingly, the proximity to the US hospitals versus those of Hermosillo leads to the routine cross-border transport of Mexican nationals to the US to seek care.

transport on the US side. Provision of and use of these resources for transport of Mexican nationals to Holy Cross Hospital or Tucson area hospitals is costly directly and indirectly. Utilization of the limited emergency medical services (EMS) resources of NFD for cross-border transport of Mexican citizens to Holy Cross or Tucson often directly affects NFD's ability to provide appropriate EMS coverage for the US citizens of Nogales, AZ by tying up EMS vehicles and personnel at the border. In an effort to offset these possibilities NFD must maintain a greater number of active personnel and vehicles than the average similar sized city. Under current budgetary constraints, maintenance of this increased active staffing remains problematic for NFD and the local Nogales, AZ government.

Table 3 provides an annual breakdown of the financial impact that cross-border transport has had on Nogales Fire Department EMS. Though the compensation amounts and rates have not been determined to date, it has been estimated by officials at the NFD that compensation rates range from 0-15% per call.[11] Therefore, a significant loss of revenue is incurred per cross-border transport. The consequences of these uncompensated costs of services have severely affected the budget of Nogales FD, which is directly financed via local governmental funding allocations. In an effort to increase revenue inflow per call to compensate for the losses due to cross-border transport, NFD had to increase their base rate per run from $175 to $425 in August 2001. A consequence of this increase has been greater out-of-pocket expense for US citizens utilizing the NFD EMS transport, thereby placing the financial burden of lost revenue for cross-border transport of Mexican nationals on the local US citizens.

Year (January-December)	# of cross-border transports	Annual charges for cross-border transport ($)	Average Cost / call (annual charges/total # calls) ($)
1998	247	43,096	174.48
1999	86	16,961	197.22
2000	148	26,487	178.97
2001*	215	43,363	215.64
2002#	174	73,950	425.00

Table 3. Annual Nogales Fire Department cross-border transports and charges (1998-2/02)[11]

*Base rate increase from $175 to $425 in August 2001

#Annualized projected averages calculated from previous four years

2002 transports = [(1998 transports+1999 transports+2000 transports+2001 transports) / 4]

2002 annual charges=[(1998 transports+1999 transports+2000 transports+2001 transports) / 4] x base rate of $425

Since these patients are Mexican citizens, documented as foreign nationals or medical parolees, they are not eligible to access financial programs (ie. Arizona Healthcare Cost Containment System (AHCCCS) or Medicare) within the United States to cover healthcare-related expenses.* Additionally, barring those individuals with high-cost private Mexican healthcare insurance providing international coverage for healthcare, the majority of Mexican citizens are provided healthcare service through employment social security (ie. *Instituto Mexicano de Seguro Social* (IMSS)), federal or

*Indigent medical services are not provided to nonresidents, but they can receive emergency care through the State Emergency Services (SES), a division of AHCCCS, or Federal Emergency Services (FES), a division of the federal government. The SES program contains only 9/10 of 1% of the state AHCCCS budget annually and is therefore very limited.

state government (ie. *Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado* (ISSSTE)), or the Public Health Service (ie. *Secretaria de Salud* (SSA)), none of which are acceptable payors for healthcare in the US.

When the ineligibility of Mexican nationals for healthcare coverage in the US is coupled with the high cost of trauma/emergency care, both the patient and the US healthcare system are directly affected. The high-tech, high-dollar expense of trauma/emergency care in the US can have devastating financial impacts upon a Mexican citizen patient and their families. Often, transportation costs alone can equal more than 3-6 months of the average Mexican salary. Addition of hospital charges for treatment and stay can amount to tens of thousands of dollars--a bill with no hope of being paid for by an uninsured patient from Mexico. Attempting to repay such enormous bills would drastically affect the person's lifestyle and ability to provide basic necessities for themselves or their family. Therefore, a majority of charges issued by a treating institution (eg. UMC) or transport agency (eg. Nogales Fire Department), for treatment or transport of a Mexican national tend to be defaulted and uncompensated. Though international liaison officers and credit agencies exist for both UMC and TMC, the ability to track Mexican nationals upon return to Mexico is difficult and there are currently no criminal or civil actions (eg. wage garnishment, repossession) with international jurisdiction which can be undertaken against foreign nationals to acquire payment for or reprimand for default of payment for services rendered.

In the current budget crisis facing the state of Arizona, the ability of the state to compensate trauma/emergency Centers for these uncompensated foreign nation charges has steadily dwindled over the last few years. **Table 4** and **Figures 3** and **4** provide some insight into the current financial impact which uncompensated foreign national care has on the Arizona healthcare system.

Based upon the data presented in **Table 4**, the total Arizona hospital charges for treatment of uninsured foreign nationals in 2001amounted to $52,561,896.[12*] On average, the reporting hospitals included in this report were reimbursed 15% of the total charges with the majority of the reimbursements coming from AHCCCS's State Emergency Services (SES) funding program. Thus, approximately $44,677,612 in charges have been uncompensated for Arizona hospitals, leaving the hospitals to deal with the budgetary shortfalls that occur.

* Jim Haynes, CFO of Arizona Hospital and Healthcare Association and author of the report providing this data has noted that these numbers are assumed to drastically underestimate the actual foreign national care charges and are assumed to capture only 25-50% of the true charges. Additionally, he notes that the three-month reporting period upon which the report is based (February 1st – April 30th, 2001) was "an unusual three month period that was much lower than normal for the last several years."[12] Under these assumptions, the true amount of charges for services provided by Arizona hospitals to uninsured foreign nationals for 2001 would be 50-75% higher (between $105,123,792 and $210,247,584).

Arizona Hospital	3-month reported charges ($) (2/1/01-4/30/01)	Annualized (2001) charges ($)*
Banner Health System (includes Good Samaritan-Phoenix)	3,198,554	12,794,216
Benson	7,304	29,216
Carondelet Health Network-Tucson (St. Mary's and St. Joseph's)	451,613	1,806,452
Chandler Regional	1,323,284	5,293,136
Copper Queen	23,935	95,740
Holy Cross**	n/a	679,336
John C. Lincoln North Mountain	1,155,791	4,623,164
Maricopa Community	651,280	2,605,120
Maryvale	237,921	951,684
Phoenix Children's	248,416	993,664
St. Joseph's – CHW (Phoenix)	4,008,048	16,032,192
Tucson Medical Center	776,798	3,107,192
University Medical Center	887,696	3,550,784
Total Charges	**12,970,640‡**	**52,561,896**
Compensated Charges#	1,945,596‡	7,884,284
Uncompensated Total†	**11,025,044‡**	**44,677,612**

Table 4. Arizona hospital charges related to treating uninsured foreign nationals: 3 month period and annualized, 2001[12]

*Annualization equation: Annualized charges = 3-month period charges x 4
**Holy Cross data provided by report issued by Rich Polheber, CEO Holy Cross Hospital; no 3-month data available
#Compensated charges = total charges x 15% average compensation rate
†Uncompensated total = total charges – compensated charges
‡Sum does not account for Holy Cross 3-month data

Extraction of data specific to southern Arizona hospitals included in the report (UMC, TMC, the Carondelet Health Network, Holy Cross, Benson, and Copper Queen) provides an approximation of the charges for uninsured foreign national services in southern Arizona.* As shown in **Figure 3**, the approximate 2001 total charges for treatment of foreign nationals by southern Arizona hospitals are $9,268,720.** Assuming a 15% compensation rate, the uncompensated charges for southern Arizona hospitals for 2001 is $7,878,412. The data presented in **Figure 4** indicates that UMC, TMC, the Carondelet Health Network (includes St. Mary's and St. Joseph's), and Carondelet Holy Cross Hospital share the heaviest burden of charges for foreign national care. University Medical Center and TMC, the two level I trauma Center hospitals of southern Arizona, garner roughly 65% of the charges, representing $6,657,976 in the year 2001 alone.***

* Extraction of data specific to central Arizona hospitals included in the report and figures similar to those created for the southern Arizona hospitals can be found in *Appendix A* (**Figures A-5** and **A-6**)

** Under the assumptions presented from the previous page for the data for the entire state, the true amount of charges for services provided by southern Arizona hospitals to uninsured foreign nationals for 2001 would be 50-75% higher (between $18,537,440 and $37,074,880).

*** Assumption of 50-75% higher, therefore between $13,315,952 and $26,631,904.

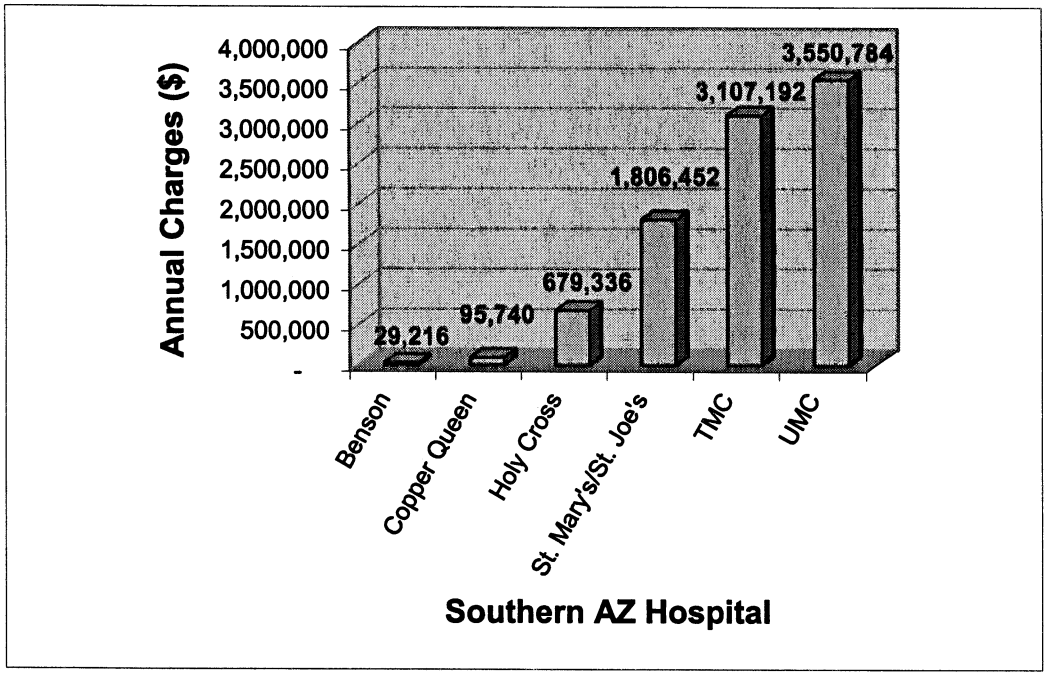

Figure 3. Annual charges ($) by southern Arizona hospital for treatment of foreign nationals (2001)[12*#]

*Dollar amounts annualized from 3-month reported data for period February 1, 2001 – April 30, 2001
Annualization equation: Annualized charges = 3-month period charges x 4)
#Holy Cross data supplied by separate report issued by Rich Polheber, CEO Holy Cross Hospital

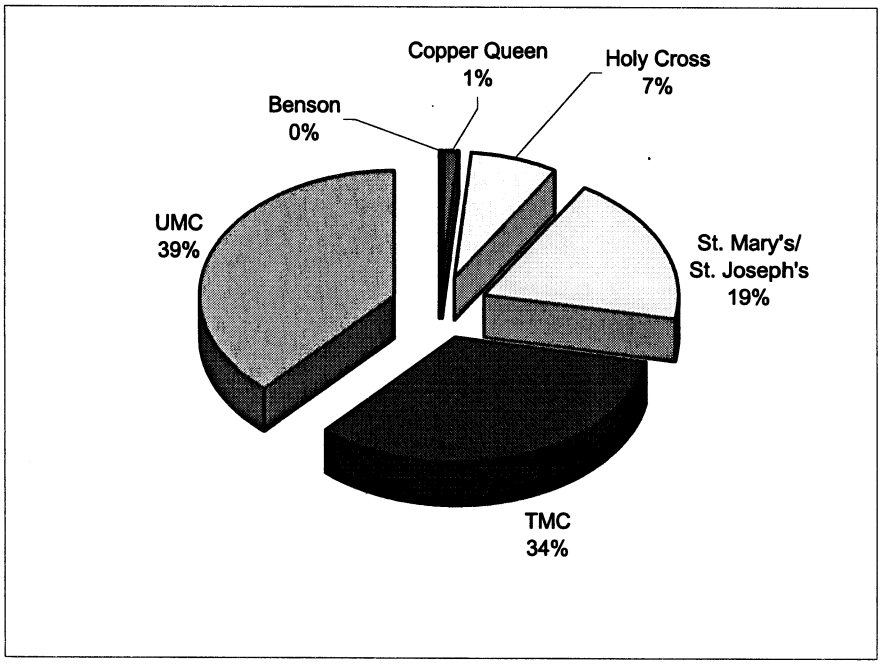

Figure 4. Percentage of annual charges for treatment of foreign nationals by southern AZ hospital (2001)[12]

Due to the lack of funding for reimbursement for emergency services provided to foreign nationals, several trauma Centers across the state, including UMC and TMC have threatened to close their doors. Even after a $4.3 million bailout bill was signed by Governor Jane Hull and provided to UMC and TMC trauma Centers, TMC has slated to

close its trauma center within one year due to lack of financial solvency and ability to run a high-cost trauma center. Dr. Richard Carmona, medical director of the Southern Arizona Emergency Services Council and current Surgeon General candidate, recently stated, "Over the next year, TMC probably will phase out its role in trauma care...We [will] expect UMC and the University to step up to be the trauma center for Southern Arizona."[13]

This closure will pit UMC as the only level I trauma center for the entire southern Arizona region, a region with an estimated population of roughly 3 million persons. With such a huge population of US citizens to cover, UMC will be overtaxed and overwhelmed with trauma and emergency caseload. Increasing the burden on this single trauma center by including Mexican nationals from the Arizona-Sonora border who require trauma and emergency care into the caseload will push UMC beyond its already strained breaking point. The burden of a projected $7 million to $26 million budget deficit annually due to uncompensated charges for services to uninsured foreign nationals could possibly place UMC close to or in bankruptcy. This could ultimately result in disaster as the greater than 3 million persons of southern Arizona could be left without a level I trauma center and the Arizona Health Sciences Center without an academic medical center training facility.

IV. Project Rationale and Overview

Based upon the negative impacts that Mexican border citizens' reliance upon the Arizona healthcare system for trauma and emergency services on both health outcomes and financial solvency of Arizona health institutions, three possible solutions have been proposed. First, securing external financial support to offset the uncompensated charges for trauma/emergency services provided to uninsured foreign nationals. Second, establishing cross-border health insurance programs which can serve as valid payors for internationally accrued charges by Mexican nationals in the United States and vice-versa. And, three, decreasing reliance upon the Arizona healthcare system by enhancing trauma/emergency infrastructure on the Mexico side of the border.

For the first solution, the logical source of external financial support is the federal government. And indeed, this crisis has been brought to the attention of the US Congress by Representative Jim Kolbe (Rep). On July 26th, 2001, Rep. Jim Kolbe of Arizona introduced the "Border Hospital Relief Act" (HR 4973) to create a $25 million grant program to provide relief funding for border hospitals that provide emergency services to uninsured foreign nationals, with priority to hospitals with 100 or fewer inpatient beds. Kolbe stated in a press release, "Border communities lack the infrastructure to handle the onslaught of [foreign nationals] and their hospitals could fail without increased federal aid."[14] Bruce Norton, chief financial officer of UMC, supports the proposed legislation and states, "Any help that we can get in regard to the foreign national situation is greatly at need. We provide uncompensated care to illegal citizens, and that takes away our opportunity to help Arizona residents dollar for dollar."[14] Unfortunately, the proposed legislation has remained "in committee" and has lost support since the federal government's attention has been refocused by the September 11th terrorist attack. The grant program remains without funding.

The development of cross-border health insurance for international coverage, as deemed by the second solution, is currently being studied for its feasibility. The Academy of International Health Studies (AIHS) launched this feasibility study in March 2000 through support of a research and consulting grant from the California HealthCare Foundation and will work with Medimetrix, Milliman and Robertson, Casaubon & Associates and the FunSalud, the Mexican Health Foundation.[15] Though the study was to conclude in late 2000, no published results could be found via literature or Internet review. Contact with the president and vice-president of AIHS has been made regarding results of the study, but no response has been provided. This report's author has assumed that the study provided negative feasibility.

Under the rationale of third convened solution, the *Centro de Estabilizacion Medica de Nogales, Sonora* project was developed. In January 2001, the Arizona-Sonora Healthy *Gente* 2010 Summit conveyed to establish goals and priority actions for the future health of the Arizona-Sonora border. This summit was patterned after consensus development models utilized in the development the Arizona Department of Health Service's (ADHS) "Healthy Arizona 2010" document. Those attending represented organizations from the United States (including ADHS, southern Arizona hospitals, and the Arizona consulate to

Sonora), Mexico (including *la Secretaria de Salud del Estado de Sonora* and the Sonoran consulate to Arizona), and several binational coalitions (including the United States-Mexico Border Health Commission (USMBHC), the Arizona-Mexico Commission (AMC), the United States-Mexico Border Health Association (USBHA), *Comision Sonora-Arizona*, and *la Oficina de Salud Publica Sonora Arizona* (OSSA)). Following the development of 25 border health priorities, the number one consensus priority was the improvement of healthcare infrastructure and communication along the Arizona-Sonora border.

A steering and planning board, known as the Binational Advisory Board (BAB), was formed to oversee the implementation of programs to tackle this priority. The board consists of representatives from the following organizations: Holy Cross Hospital, TMC, UMC, *Hospital General del Estado de Sonora*, *Hospital General de Nogales*, the Arizona Department of Health Services, *Secretaria de Salud del Estado de Sonora*, the USMBHC, the AMC, *Comision Sonora-Arizona*, and *la Oficina de Salud Publica Sonora Arizona* (OSSA). This board addressed the need to upgrade services provided to border residents and ensure prudent utilization of existing limited resources available at the Nogales border. The culmination of the strategic planning phase for the BAB was the development of the Triage and Stabilization Unit, later renamed *Centro de Estabilizacion Medica de Nogales, Sonora* (Medical Stabilization Center of Nogales, Sonora).

The BAB designed the Medical Stabilization Center project through utilization of a pre-existing successful binational project model known as *NeoVida*-Agua Prieta. The *NeoVida*-Agua Prieta project established a neonatal unit in Agua Prieta, Sonora, Mexico to provide immediate local care to critically ill neonates on the Mexican border. This project was created to improve neonatal health outcomes and reduce the total number of critically ill neonates transported from the Agua Prieta area to the neonatal centers at TMC and UMC. This project has been highly successful in both health and cost outcomes. As of March 2002, *NeoVida* has serviced 644 infants since its inception in 1997 with a demonstrated decrease in infant mortality rates from 17% to 2% in the project's first year alone. Significant cost savings to UMC and TMC have also been realized with estimates of savings at roughly $1,500,000 due to decreases in neonatal transports from Agua Prieta and uncompensated charges for neonatal services provided to uninsured foreign nationals by TMC and UMC.

Capitalizing on the success of the *NeoVida* model and the pre-existing binational relations established through its innovative approach, the BAB was successful in planning and implementing the Medical Stabilization Center within the *Secretaria de Salud* health system in Nogales, Sonora. Situated within the physical structure of the *Hospital General de Nogales*, the Center provides a prime central location in the city for delivery of stabilizing trauma and emergency care. Though not a level I trauma center, the Center upgrades the emergency and trauma services available to the city of Nogales, Sonora and provides a foundation upon which further trauma/emergency healthcare infrastructure in the area can develop.

Upon its inauguration in May of 2002, this Center will provide stabilizing care to trauma and emergency patients within the Nogales border region. Provision of advanced trauma and life support training for emergency staff at *Hospital General de Nogales*, upgrade of facilities, provision of advanced diagnostic and therapeutic devices and instrumentation, and twenty-four hour a day on-call emergency staff are essential components to the Center. If further care is required at a high-level trauma/emergency center, the patient, following stabilization, will be transported via *Ambulance Vital*, a contracted ambulance service, to *Hospital General del Estado de Sonora* in Hermosillo, Sonora.[*,**] In this manner, Mexican citizens will be provided immediate care within their own country's healthcare system and will not have to rely on the neighboring Arizona healthcare system and risk cross-border transport delays in care which could culminate in higher levels of morbidity and/or mortality. The final result should be enhanced stabilization care provided in a timely manner in the most appropriate setting that is technically proficient and cost-effective for both the Sonora and Arizona healthcare systems.

Further planning and implementation details can be found in the project proposal document developed by the Binational Advisory Board located in *Appendix C.*

Itemized budgetary information can be found within the original project proposal document and in the "Healthy *Gente* 2010 Project Budget Document" in *Appendix D.* The proposed budget for year I of the Medical Stabilization Center is $232,372 (without in-kind support) and $290,000 (with in-kind support included). Current sources of funding include in-kind support from UMC and TMC (ie.staff time) and Holy Cross Hospital (ie. $37,000 in donated equipment) as well as direct monetary support of $25,000 from the United States-Mexico Border Health Association.

Marketing efforts to garner financial support for the project are underway and will be conducted by members of the Binational Advisory Board in the US and the project's *patronato* on the Mexico side.[***]

Potential funding sources include the following: all Arizona hospitals including the individual hospital foundations, the *Maquiladora* Association, Rotary International, Flynn Foundation, United Way, Arizona state legislature, United States federal government via Congress and Department of Health and Human Services, and St. Luke's Charitable Trust. Other potential funding sources could include the Kellogg Foundation and the Gates Foundation.

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[*] An established set of transfer protocols has been developed between *Hospital General de Nogales* and *Hospital General del Estado de Sonora* in Hermosillo by Dr. Marcos Serratos, chief of trauma surgery at *Hospital General del Estado de Sonora*. A list of the established protocols is found in *Appendix J.*

[**] A United States citizen treated at the Center may be transported across the border to Holy Cross Hospital once stabilization care has been provided.

[***] A *patronato* is defined as a community-support foundation or network and is often developed alongside a public health project in Mexico. Mr. Jorge Freig, a local Nogales, Sonora community member, leads the *patronato*. The responsibilities of the *patronato* include development of community support for the project and attainment of local funding to ensure project sustainability.

V. Literature Review

To assess the feasibility and locate sources or models upon which to pattern the evaluation plan for the *Centro de Estabilizacion Medica de Nogales, Sonora* a literature review was conducted.

As stated in the introduction of this report, no other binational project of this type (barring the previously mentioned *NeoVida*-Agua Prieta neonatal project) has been attempted in any of the four US or six Mexican states. To determine whether any similar projects do exist in the healthcare literature, MEDLINE and Internet searches were conducted. MEDLINE was accessed via the National Library of Medicine's PubMed website (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi). The following searches and hits were recorded:

(1) Keyword search: border health AND projects - 13 hits
(2) Keyword search: border AND emergency AND healthcare – 7 hits
(3) Keyword search: border AND trauma AND healthcare – 8 hits
(4) Keyword search: Mexico AND border AND trauma care – 57 hits
(5) Keyword search: Mexican AND border AND health – 81 hits
(6) Keyword search: Mexican border AND emergency – 4 hits
(7) Keyword search: Mexican border AND trauma – 2 hits

Upon review of the results, no projects or studies have been published with regards to the development or assessment of provision of trauma/emergency healthcare along the US-Mexico border.

The closest project of any type in the MEDLINE literature search targeting the US-Mexico border population is the "Dar a Luz" project which provides "prenatal obstetrical care and anticipatory birthing education that is sensitive to Mexican-American traditions, community consciousness-raising, and a cooperative obstetrical agreement with Tucson hospitals."[16] The University of Arizona Department of Family and Community Medicine conducts the project and provides the care via healthcare professionals and lay volunteers coordinated by medical students through the student-run Commitment to Underserved People Program (CUP) at the University of Arizona College of Medicine. Upon contact of the principal investigators it was determined that this project has little significant similarity to the *Centro de Estabilizacion Medica* project.

Internet searches were conducted through the websites of the border health offices of the respective US border states as well as several other US-Mexico border health specific organizations. The following websites were searched:

(1) Office of Border Health, Arizona Department of Health Services (http://www.hs.state.az.us/phs/borderhealth/);
(2) Office of Binational Border Health, California Department of Health Services, (http://www.dhs.cahwnet.gov/ps/dcdc/COBBH/);
(3) Border Health Office, District III Public Health Division, New Mexico Department of Health, (http://www.nmsu.edu/~bho/bho/);

(4) Office of Border Health, Texas Department of Health, (http://www.tdh.state.tx.us/border/);
(5) *La Secretaria de Salud de Mexico* (http://www.ssa.gob.mx/);
(6) *La Secretaria de Salud del Estado de Sonora* (http://www.salud-sonora.gob.mx/).
(7) Border Health Commission (http://www.borderhealth.gov/);
(8) HRSA Border Health Initiative (http://bphc.hrsa.gov/bphc/borderhealth/);
(9) Pan American Health Organization (http://www.fep.paho.org/);
(10) United States-Mexico Border Health Commission (http://www.borderhealth.net/);
(11) United States-Mexico Border Health Association (http://www.usmbha.org/english/index.htm);
(12) US Environmental Protection Agency – US-Mexico Border Health Program (http://www.epa.gov/usmexicoborder/);
(13) California/Baja California Binational Health Council (http://www.borderhealth.com/);
(14) The Border Health Initiative (http://www.pciborderregion.com/home_EN.html);
(15) New Mexico Border Health Council (http://www.nmsu.edu/~bho/).
(16) Border Health Information and Education Network (http://www.bienhealth.org/main.htm).
(17) US-Mexico Affairs, Department of Health and Human Services Global Health Affairs (http://www.globalhealth.gov/americaaffairsusmexico.shtml).

Following an extensive search of these sites, no projects similar in nature to this one have been found or published on the websites.

The following assumptions were employed for the remainder of the literature review. First, based upon the locality and level of infrastructure of the new Center's location, it has been assumed that the Center will provide trauma/emergency care similar in nature to a US hospital designated level III.* This assumption has been made based upon the accepted definition of trauma level III designation criteria.** The Medical Stabilization Center has the capacity and staff to provide this level of service to trauma/emergency patients, including assessment, resuscitation, stabilization, and transfer services. *Hospital General del Estado de Sonora* in Hermosillo is assumed to be a level I trauma Center based upon the comprehensive services provided at that hospital.***

* No trauma level designation criteria or formal regionalization plan exists in the Mexican state of Sonora.

** The following definition of trauma level III designation is provided by the Colorado Department of Health and Environment: "Level III: Provides initial evaluation and stabilization (surgically if appropriate) to the trauma patient. Comprehensive medical and surgical inpatient services are available to those patients who can be maintained in a stable or improving condition without specialized care. Emergency physicians and nurse are immediately available, and surgeons within 20 minutes, to assess, resuscitate, stabilize, and initiate transfer as necessary to higher level Trauma Care Service."[17]

*** This assumption is based on the following definition of a level I center: "Level I: Provides the highest level of definitive and comprehensive care for patients and complex injuries. Emergency physicians, nurses, and surgeons are immediately available to the trauma patient. Level I trauma centers are

The final assumption regards standards of trauma/emergency care between US and Mexico level I and level III centers, which, for purposes of this report, are assumed similar. This assumption allows cross-comparison of studies of level III centers of the United States with the level III designated *Centro de Estabilizacion Medica*. Through these assumptions literary evidence for support of the new Center can be provided.

Several studies conclude that no statistically significant difference in mortality rates exist between provision of initial stabilization care at a lower level trauma center followed by transfer to higher-level center versus direct transport. Rogers *et al.* [18] conducted a case-control study to examine the outcome of patients transferred to a level I hospital after stabilization at an outlying hospital in a rural setting. He concluded that initial stabilization care at outlying hospitals prior to transport to level I centers did not adversely affect mortality. In a 4-year retrospective outcomes review of a level I trauma Center, Veenama and Rodewald[19] concluded that initial triage and stabilization of severely injured trauma victims at level III centers prior to transfer to level I provided outcomes similar to national normative data. Kearney *et al*[20] conducted a retrospective study demonstrating no statistically different outcomes in blunt injury victims whose definitive care was delayed due to initial evaluation and stabilization at outlying hospitals. Based upon these conclusions, implementation of the new *Centro de Estabilizacion Medica* and the initial stabilization care it will provide should be as successful in regards to mortality and morbidity outcomes as direct transport to Hermosillo. The population of Nogales, Sonora will be provided an effective trauma system through which even severely injured trauma victims and life-threatening emergencies can be provided appropriate care.

The implementation of the new Medical Stabilization Center and the utilization of devised trauma and transport protocols will have positive impact on outcomes, staff efficiency, and resource utilization. Sariego[21] studied the impact of implementation of a formal trauma program in a small, community-based hospital. This retrospective study demonstrated that implementation of the program led to a decrease in the number of transfers to level I centers, an increase in the number of cases cleared in the emergency department, and a decrease in the number of inappropriately managed cases. Sariego concludes that the program increased the efficiency of resource utilization and improved the level of care received by the trauma patients. Richardson *et al.* [22] concurs with a majority of Sariego's findings that development of a trauma program appears to increase the efficiency of care delivered to trauma patients. This study provided a before and after analysis of a newly designated level III rural hospital compared with a similar hospital without level III designation. Findings demonstrate increased surgical involvement of the level III hospital, increased number of locally operated cases, and (contrary to Sariego's findings) increased transfers to level I centers. In a Canadian study of the impact that trauma program implementation had on care delivery, Simons *et al.* [23] demonstrated decreased lengths of stay and increased survival rates after implementation of the program. Simons concludes:

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responsible for research, professional and community education, prevention, and for providing consultative community outreach services and programs statewide."[17]

> "Trauma care improvement can be achieved by a multidisciplinary team focusing on the process of care, developing a dedicated trauma service to manage the more seriously injured patients, collecting them onto a single unit, and initiating program management."[23]

Nathens and Maier[24] provide an overview of several studies that suggest trauma outcomes in smaller level III trauma centers or centers with dedicated trauma programs with "appropriate, functional triage protocols" are comparable to national norms.

Implementation of the trauma protocol will require program coordinators and emergency staff to upgrade service level and efficiency to provide the highest level of trauma/emergency care possible within the new Medical Stabilization Center. Bintz *et al.* [25] provides some insight into the responsibilities which program coordinators and the surgery team must undertake to run a successful level III trauma center: (1) coordinate trauma care in the community, including education and organizational efforts; (2) provide necessary emergency procedures to achieve optimal resuscitation and stabilization; (3) rationally triage patients for transfer to a higher level trauma center based upon assessment of patient injuries and institutional capabilities; and, (4) provide definitive care for the subset of patients with no need for subspecialty intervention. All of these responsibilities have been discussed and included in the implementation of the new Center.

Based upon this review, support for the design, implementation, and potential success of the *Centro de Estabilizacion Medica* has been provided. Under the assumption that the Center is similar to a level III trauma unit, the Center should expect increased efficiency in trauma/emergency care and resource utilization, increased caseload, improved outcomes and survival rates, and better coordination of trauma/emergency care locally and statewide.

VI. Evaluation Plan

A. "Logic Model" Theory Overview

Before embarking upon the full outline of the evaluation plan for the *Centro de Estabilizacion Medica de Nogales, Sonora* project it is important to understand the theoretical framework upon which the design and implementation of this project are based. To better conceptualize this framework and generate an appropriate evaluation plan based on this framework, a simple methodology for community-based programming known as the "Logic Model" theory was employed.

Established by the WK Kellogg Foundation, the "Logic Model" theory provides practical guidance in community-based programming. According to the Kellogg Foundation *Logic Model Development Guide*, the logic model is:

> "...a systematic, visual way to present a planned program with its underlying assumptions and theoretical framework. It is a picture of why and how you believe a program will work."[26]

The logic model provides a set of visual reference templates and guides upon which various components of a program design can be integrated. Based upon these worksheet templates, creation of a logic model facilitates all phases of the program from planning to evaluation.* As shown in **Table 5** on the following page, the logic model can provide clear guidance and benefit through each stage of programming from planning to evaluation. During the program planning stage, a logic model provides a means for clarifying program strategy, finding "gaps" in the theory or logic of the project, building consensus on how the program will work and what the intended goals and objectives are, and establishing timelines. During the implementation phase of the program, the logic model assists in establishment of a management plan and provides an inventory of resources, activities, and outputs that the program utilizes and produces. For the evaluation phase, the logic model provides a means to establish an evaluation plan through documentation of accomplishments, data organization, definition of variance between the planned and actual program, and engagement of stakeholders in design and evaluation efforts of the program.[26]

* Logic model worksheet templates can be found in *Appendix G.*

Program Elements	Criteria for Program Success[1]	Benefits of Program Logic Models[2]
Planning & Design	Program goals and objectives, and important side effects are well defined ahead of time.	Finds "gaps" in the theory or logic of a program and work to resolve them.
	Program goals and objectives are both plausible and possible.	Builds a shared understanding of what the program is all about and how the parts work together.
Program Implementation & Management	Relevant, credible, and useful performance data can be obtained.	Focuses attention of management on the most important connections between action and results.
Evaluation, Communication, & Marketing	The intended users of the evaluation results have agreed on how they will use the information.	Provides a way to involve and engage stakeholders in the design, processes, and use of evaluation.

Table 5. Logic model's relationship to program success and benefits[27]

Figure 5 provides a visual summary of the logic model theory. Examination of this figure demonstrates the centrality of the core logic model and theoretical underpinnings of the various stages of programming.

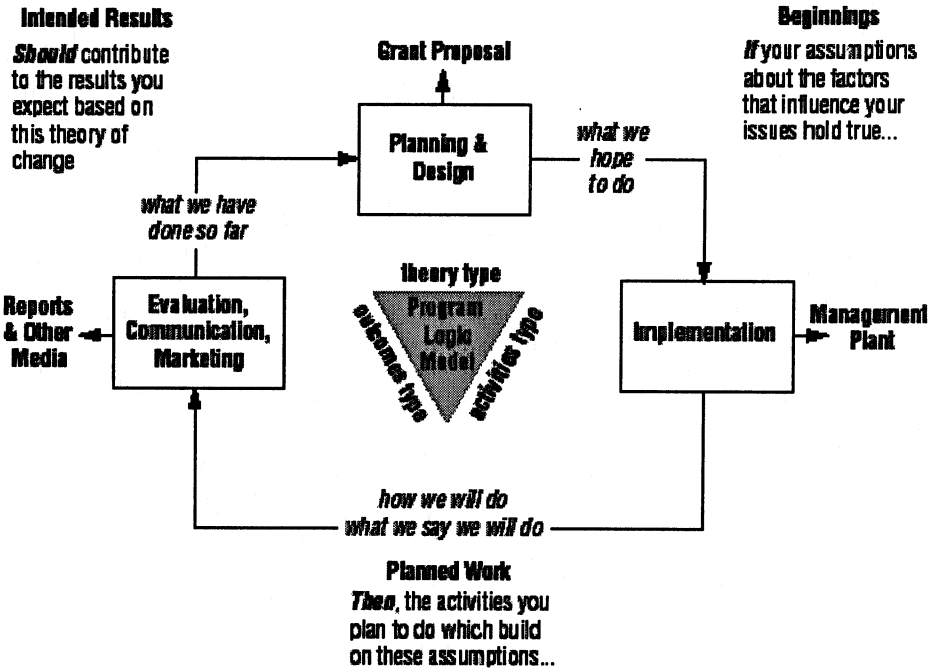


Figure 5. Logic Model Visual Summary[27]

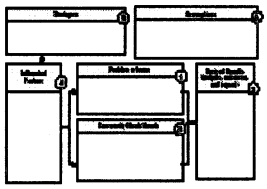
The logic model components are linked causally by either the time order or the sequence of actions leading from procurement of resources and consideration of influential factors (known as the *Beginnings*) to development of program activities (the *Planned Work*) to the ultimate impact that program has on the community it serves (the *Intended Results*).

The *Planned Work* that the program accomplishes includes the *Resources* and *Activities* that the program encompasses. *Resources*, according to the Kellogg Foundation, include "all human, financial, organizational, and community resources a program has available to direct toward the work of the program."[26] The *Activities* of the program include "processes, tools, events, technology, and actions that are an intentional part of the program implementation."[26] The *Activities* are intended to bring about the changes or results the program wishes to accomplish. The theoretical culmination of the utilization of program resources and its actions are considered the *Intended Results*. *Outputs* are the direct products or services provided by the program through its *Activities*. *Outcomes* are the "specific changes in program participants' behavior, knowledge, skills, status, and level of functioning."[26] *Outcomes* are generally divided into short-term (1-3 years) and longer-term (4-6 years). The *Impacts* that the program makes is the "fundamental intended or unintended change occurring in organizations, communities, or systems as a result of the program activities within 7-10 years."[26]

Several "Approach Models" exist in the development of the program's logic model: theory, activities, and outcomes approaches. The Kellogg Foundation provides the following definition for Outcomes Approach Models, "*Outcomes Approach Models* focus on the early aspects of program planning and attempt to connect the resources and/or activities with the desired results in a workable program."[27] Based upon this definition and the focus on the causal relationship between resources and activities to outcomes, the Outcomes Approach Model was chosen for this project. Additionally, this approach model tends to be most useful in "designing effective evaluation and reporting strategies."[27]

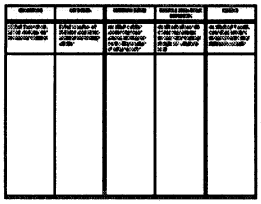
The flowchart (**Figure 6**), on the following page, illustrates the components involved in the development of a logic model throughout the life of a program from planning to implementation.

1. Program Planning



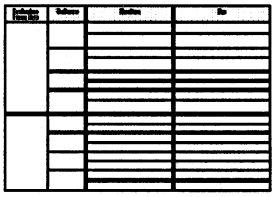
For more detail, see the Program Planning Template on p. 57.

2. Program Implementation

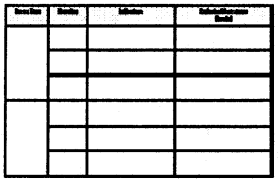


For more detail, see the Program Implementation Template on p. 54.

3. Program Evaluation



For more detail, see the Evaluation Planning Template on p. 59.



For more detail, see the Indicators Development Template on p. 61.

CLARIFYING PROGRAM THEORY:

1. **PROBLEM OR ISSUE STATEMENT:** Describe the problem(s) your program is attempting to solve or the issue(s) your program will address.
2. **COMMUNITY NEEDS/ASSETS:** Specify the needs and/or assets of your community that led your organization to design a program that addresses the problem.
3. **DESIRED RESULTS (OUTPUTS, OUTCOMES AND IMPACTS):** Identify desired results, or vision of the future, by describing what you expect to achieve near and long-term.
4. **INFLUENTIAL FACTORS:** List the factors you believe will influence change in your community.
5. **STRATEGIES:** List general successful strategies or "best practices" that have helped communities like yours achieve the kinds of results your program promises.
6. **ASSUMPTIONS:** State the assumptions behind *how* and *why* the change strategies will work in your community.

DEMONSTRATING YOUR PROGRAM'S PROGRESS:

1. **OUTPUTS:** For each program activity, identify what outputs (service delivery/implementation targets) you aim to produce.
2. **OUTCOMES:** Identify the short-term and long-term outcomes you expect to achieve for each activity.
3. **IMPACT:** Describe the impact you anticipate in your community in 7-10 years with each activity as a result of your program.
4. **ACTIVITIES:** Describe each of the activities you plan to conduct in your program.
5. **RESOURCES:** Describe the resources or influential factors available to support your program activities.

PROGRAM EVALUATION QUESTIONS AND INDICATORS:

1. **FOCUS AREA:** From your program theory logic model, list the components of the most important aspects of your program.
2. **AUDIENCE:** Identify the key audiences for each focus area. Who has an interest in your program?
3. **QUESTIONS:** For each focus area and audience, list the questions they may have about your program.
4. **INFORMATION USE:** For each audience and question you have identified, identify the ways you will use the evaluation information.
5. **INDICATORS:** Describe what information could be collected that would indicate the status of your program and its participants for each question.
6. **TECHNICAL ASSISTANCE:** Indicate the extent to which your organization has the evaluation and data management expertise to collect and analyze the data that relates to this indicator.

Figure 6. Logic Model Program Flowchart[26]

The primary focus of this report will be the evaluation components of the project's logic model.* The sections to follow will stipulate the focus areas, the audiences, the evaluation questions, the information use, indicators, and technical assistance needed for the evaluation component of this project.

* Planning components such as the problem statement, strategies, community needs, and desired results have already been expanded upon in the previous needs assessment and program planning and implementation sections of this report. A copy of the original project proposal for this project is provided in *Appendix C*. Program implementation worksheets are included in *Appendix E*.

B. Focus Areas and Audiences

Focusing of the evaluation is essential due to the inability to accurately and reliably tracks all aspects of the activities and outcomes of the *Centro de Estabilizacion Medica*. By focusing on several key activities and outputs of the project we will be able to prioritize indicators, employ project-specific data tracking systems, and produce reliable reports for formative and summative evaluation efforts.

Though the following focus areas are still negotiable between audiences of the project, these focus areas were considered to be most important to the majority of the stakeholders of the project. Within **Table 6**, the focus areas are grouped within three domains: context, implementation, and outcomes. Context focuses on evaluation of relationships and capacity, implementation focuses on assessing quality and quantity aspects, and outcomes focus on measuring effectiveness, magnitude, and satisfaction. Each focus area is grouped with the audience(s) to which it pertains.

DOMAIN	FOCUS AREA	AUDIENCE
CONTEXT	Community relationship	*SSA*, *Hosp General* staff, Nogales community, BAB, media, public officials
	Treatment capacity	*SSA*, *Hosp General* staff, Nogales community, BAB
IMPLEMENTATION	Funding	Funders, BAB, US hospitals, public officials, *SSA*, *Hosp Gen* staff, media
	Quantity of cases	*Hosp Gen* staff, *SSA*, BAB, public officials
OUTCOMES	Effectiveness of care	Funders, *Hosp Gen* staff, BAB, *SSA*, public officials, Nogales community, media
	Costs of care	Funders, *SSA*, *Hosp Gen* staff, BAB
	Satisfaction with care	Nogales community, *Hosp Gen* staff, *SSA*, BAB, public officials

Table 6. Evaluation focus areas and audiences for *Centro de Estabilizacion Medica*

C. Evaluation Questions and Information Use

Based on the stipulated focus areas, a series of evaluation questions can be generated to prioritize the most important areas of the project that the evaluation should answer. Each question stipulated in the evaluation should gather information which can ultimately be used to relate the Center's activities and services to the intended outcomes and impacts of the project. In effect, these questions are critical to answering whether the Center is effectively solving the problematic issue it was created to tackle.

Each question must relate back to the original planning and implementation phases of the project through the project's logic model. These questions should be broad enough to appease a variety of audiences yet specific enough to demonstrate the Center's influence on emergency and trauma care within the Nogales border region. **Table 7** enumerates the proposed evaluation questions based on the previously listed focus areas and their proposed use.

FOCUS AREA	QUESTION	USE
Community relationship	1) Is Ambos Nogales community aware of new Center? 2) Perception of *Hospital General* and the new Center?	Center promotion, assess community outreach through *patronato* and BAB, public relations
Treatment Capacity	Does the new Center effectively manage the emergency/trauma caseload?	Center expansion, training/recruitment efforts, organizational and program improvements, budget
Funding	Increased funding and/or funding partners?	Budget planning, assess community outreach via *patronato* and BAB
Quantity of care	1) How many emergency/trauma cases are treated by the new Center? 2) Has the number of foreign national emergency/trauma cases treated at UMC, TMC, St. Mary's, and Holy Cross decreased? 3) How many patients were transported to Hermosillo for further care? 4) Has the number of transports of Mexican nationals by Nogales FD from the port-of-entry to Holy Cross decreased? 5) What are the most common diagnoses and procedures performed at the Center?	Evaluation of success, expansion of services, Center promotion, increase funding, Injury prevention and health education planning, training
Effectiveness of care	What are the outcomes of treatment at the Center?	Evaluation of success, outcomes research, cost-benefit analysis
Costs of care	1) What is the individual costs/case? 2) What is the average cost/case/month? 3) What is average cost/transport/month to Hermosillo? 4) Have charges for care for foreign nationals decreased at UMC, TMC, St. Mary's and Holy Cross?	Budget planning, cost-benefit analysis Evaluation success, Center promotion, increased funding,
Satisfaction with care	Are patients satisfied with their care and outcomes after treatment at the Center?	Project improvements, staff training, improve patient services, health and injury prevention education, Center promotion

Table 7. Evaluation questions and uses for *Centro de Estabilizacion Medica*

D. Indicators

The establishment of appropriate indicators to answer the evaluation questions is crucial to the evaluation. Though an infinite amount of data can be collected, only certain data provide the correct measures necessary to assess and answer your evaluation questions. Indicators are considered the "markers of success" for the evaluation plan.[26] Since consensus has not been established on appropriate indicators through dialogue with the Binational Advisory Board, the indicators provided have been developed through this evaluator experience with the currently available data sources.*

The principle for indicator development is "SMART"—Specific, Measurable, Action-oriented, Realistic, and Timed.[26] Since no projects of this type have been documented in the literature, there are no previously established indicators or success level performance measures available for the project. Therefore, indicators are being established for this evaluation plan based upon available data sources and technical support availabilities for the evaluation.

Table 8 on the following page enumerates the indicators necessary to answer the evaluation question as well as what technical assistance may be needed to accomplish data and evaluation management to collect and analyze the data that relates to each indicator.

* Remember that indicators can be modified if new data sources are discovered in the future.

Question	Indicator	Technical Assistance
Is the Ambos Nogales community aware of the new Center?	Community survey	Survey procurement, validation, and translation
Perception of *Hospital General* and the new Center?	1) Community survey 2) Biannual patient/staff surveys by *SSA*	"
Does the new Center effectively manage the emergency/trauma caseload?	1) Annual Staff survey and interviews 2) # cases treated by Center 3) # of transports 4) Budget variance 5) Supplies use	Objective evaluator, monthly patient and supplies tracking system and database creation, budget analysis
Increased funding and/or funding partners?	Yearly budget	Budget tracking and analysis
How many emergency/trauma cases are treated by the new Center?	# cases/month	Monthly tracking patient tracking system and database, data entry personnel
Has the number of foreign national emergency/trauma cases treated at UMC, TMC, St. Mary's, and Holy Cross decreased?	# foreign national cases/quarter at TMC, UMC, St. Mary's, and Holy Cross	Database data extraction personnel at each hospital, data entry personnel, database creation
How many patients were transported to Hermosillo for further care?	# cases transported to Hermosillo/month	Monthly patient tracking system, collaboration between *Hospital General de Nogales* and *Hermosillo*
Has the number of transports of Mexican nationals by Nogales FD from the port-of-entry to Holy Cross decreased?	# cases transported from port-of-entry to Holy Cross by Nogales Fire/month	Collaboration with Nogales FD, data extractor, data entry personnel
What are the most common diagnoses and procedures performed at the Center?	Most common diagnoses and procedures/month	Monthly patient tracking system and database creation (ICD-9 codes and DRGs)
What are the outcomes of treatment at the Center?	Hospital discharge data	Monthly patient tracking system and database creation, collaboration between *Hospital General de Nogales* and *Hermosillo*
What is the individual costs/case?	Cost/case	Monthly tracking system (patient logs, supplies logs), hospital billing staff, data analyst
What is the average cost/case/month?	Cost/case/month	"
What is average cost/transport to Hermosillo?	Cost/transport/month	Monthly tracking system, collaboration with Vital EMS
Have charges for care for foreign nationals decreased at UMC, TMC, St. Mary's and HolyCross?	Quarterly foreign national charge reports for UMC, TMC, St. Mary's, and Holy Cross	Database data extraction personnel at each hospital,
Are patients satisfied with their care and outcomes after treatment at the Center?	Patient satisfaction surveys	Survey creation, validation, translation, administration, collaboration between *Hospital General de Nogales* and *Hermosillo*

Table 8. Question, Indicators, and Technical Assistance needed

E. Data Sources and Limitations

Table 9 displays the existing data sources available to the project as well as the indicator data it can provide. The limitations regarding the data provided by the data source for the project are also provided.

Data Source	Indicator Data	Limitations
Hospital General de Nogales patient tracking data	Hospital discharge data	1) Manually tracked 2) No electronic database 3) Requires manual data extraction
Nogales Fire ambulance logs	# cases transported from port-of-entry to Holy Cross	"
Biannual staff/patient survey by *SSA*	Perception of services provided by *Hospital General de Nogales* by staff and patients	1) Biannual (?) administration 2) Not project-specific
Foreign national financial code 08 at UMC	# and charges for foreign national care by UMC	1) Not project-specific 2) Need technical assistance for extraction 3) Underestimates actual values
Emergency AHCCCS financial code 766 at UMC	"	" 4) Incorporates low income AZ residents, may artificially inflate values
Year I project budget	Budget	1) Year I only 2) No budget projections

Table 9. Existing data sources and limitations

Several other data sources must be created or identified to assist in the collection of indicator data for this project. The following is a list of potential data sources that should be created or identified to supply project indicator data for evaluation purposes:

1. **Monthly patient and supply tracking system for cases treated by the Center at *Hospital General de Nogales*.** Creation of this system is essential to the future evaluation of the Center. Based on the questions and indicators posited by the evaluation plan, this monthly report should include the following:
   a) # cases treated per month,
   b) # and costs of transports to Hermosillo per month,
   c) Cost data: treatment and procedural costs, supplies costs, personnel costs, hospital stay costs
   d) Diagnosis and procedural data (ie. ICD-9 and DRG codes or equivalent)
   e) Outcomes data
   f) Patient tracking information for post-treatment satisfaction surveys

g) Additional epidemiological data such as type of injury or condition and location of occurrence of emergency or trauma may be useful in facilitating future endeavors for injury prevention and health education efforts into the *Centro de Estabilizacion Medica* project

Dr. Juan Lopez, the project coordinator, should oversee the generation of the monthly reports. As he must report data to the *Secretaria de Salud* in Hermosillo, a copy of this report should be directed to the ADHS, Office of Border Health, or other border health agency at which an electronic database can be created to track the indicator data necessary for future evaluation review.

Another important consideration with this report is the need to emphasize a collaborative tracking effort for the patients who are transported to Hermosillo. Loss of follow-up with patients transported to Hermosillo for further care equates to loss of the necessary outcomes and follow-up data for the evaluation effort. Some form of communication network must be implemented between the hospitals so this does not occur.

2. **Foreign national case and charge tracking systems at TMC, St. Mary's, and Holy Cross.** Similar financial codes as those used at UMC may provide equivalent data regarding the numbers and charges for care provided to foreign nationals. Though the financial code data is limited by its broad scope and difficult interpretation, they do provide a valid approximation. Denise Brice is the data specialist at UMC who will provide the quarterly reports to Barbara Felix. Members of the Binational Advisory Board, Robert Guerrero and Rich Polheber, should be able to ascertain similar data at their respective institutions. An affiliate at St. Mary's should be identified to provide the necessary data from that hospital as well. By utilizing data from all four hospitals, the data will provide a valid approximation of the numbers and charges for care provided by southern Arizona hospitals. It may be possible in the future to create a more valid tracking system at these hospitals. A copy of a report utilizing UMC's financial codes 08 and 766 for the months of January through March of 2002 is supplied in *Appendix I.*

3. Development of a community awareness/perception survey. This survey will be employed to gather community data regarding the awareness of the new Center in the community and the perception of the services provided at *Hospital General de Nogales.* A truly important aspect to this evaluation is the determination of whether the implementation of the new stabilization center impacts Mexican nationals choice in crossing into the US for health care. As the community becomes aware of the presence of a technologically proficient stabilization center in Nogales, their perception of the emergency medical care offered with the Nogales border community should change.

Contact person for procurement of a sample community survey instrument that could be utilized by the project is Catalina Denman of *El Colegio de Sonora.* Additionally, Carmen Castro or Patti Arranda may offer assistance. Once the survey has been developed to meet the project-specific needs, the survey can be administered

through community campaigns led by the *Rigidoras* of Nogales, Sonora. Information for survey development is provided as an external component to this report.

4. Establishment of a collaborative relationship with Nogales Fire Department to create a monthly tracking report on Mexican nationals transported from the port-of-entry to the Holy Cross Emergency department. A monthly report created by NFD directly will provide up-to-date data on the numbers and types of border transports provided. Since NFD EMS is the essential link between the border and Holy Cross, monthly assessment of the numbers of transports provided by NFD is an important indicator of the success of the project. Nogales FD should be willing to provide this support since any decrease in border transports means less uncompensated charges to the already financially strapped ambulance service. Department Chief Dennis Van Auken and EMS Chief Jesus Gomez have been my contacts at NFD. I have already gathered the monthly border transport data for 2001 and January through March of 2002. The format of the data could be used as a model for similar future data extractions. The data is provided in *Appendix K (Baseline Data)*, and can serve as the baseline data upon which future evaluation of NFD border transport can be compared to.

5. Development of a post-treatment patient satisfaction survey. This type of survey would be administered either prior to discharge or shortly after discharge to assess the patient's satisfaction with the services and outcomes of the treatment he/she received at the *Centro*. As with the monthly tracking system, it is essential to have collaboration between *Hospital General de Nogales* and *Hospital General del Estado de Sonora* in Hermosillo, so patients transported between the two are not lost to follow-up and cannot complete the survey. Though not suited for project-specific data collection, an example of a "Client Satisfaction Survey" has been provided in *Appendix H.* A similar style of survey in length, simplicity, answerability, and Spanish (of course) may be employed.

6. Development of an annual staff survey and interview questionnaire. The importance of input from the staff in the evaluation process not only provides essential qualitative data for the project evaluation, but also provides an insider's perspective on the perceived effectiveness and performance of the project. Additionally, staff members can provide meaningful insight into what could be improved to make the project run more successfully. Administration of the survey and/or staff interviews should be conducted by an objective evaluator so as not to bias response.

The staff interview format should be open-end ended discussion style but structured around the following domains: 1) perceptions of emergency health care before and after opening of the Center, 2) perceptions of the hospital's capacity to handle increased trauma caseloads, 3) public perception of the hospital, and 4) perceptions on why Mexican nationals seek medical attention in the US.

F. Evaluation Process and Timeline

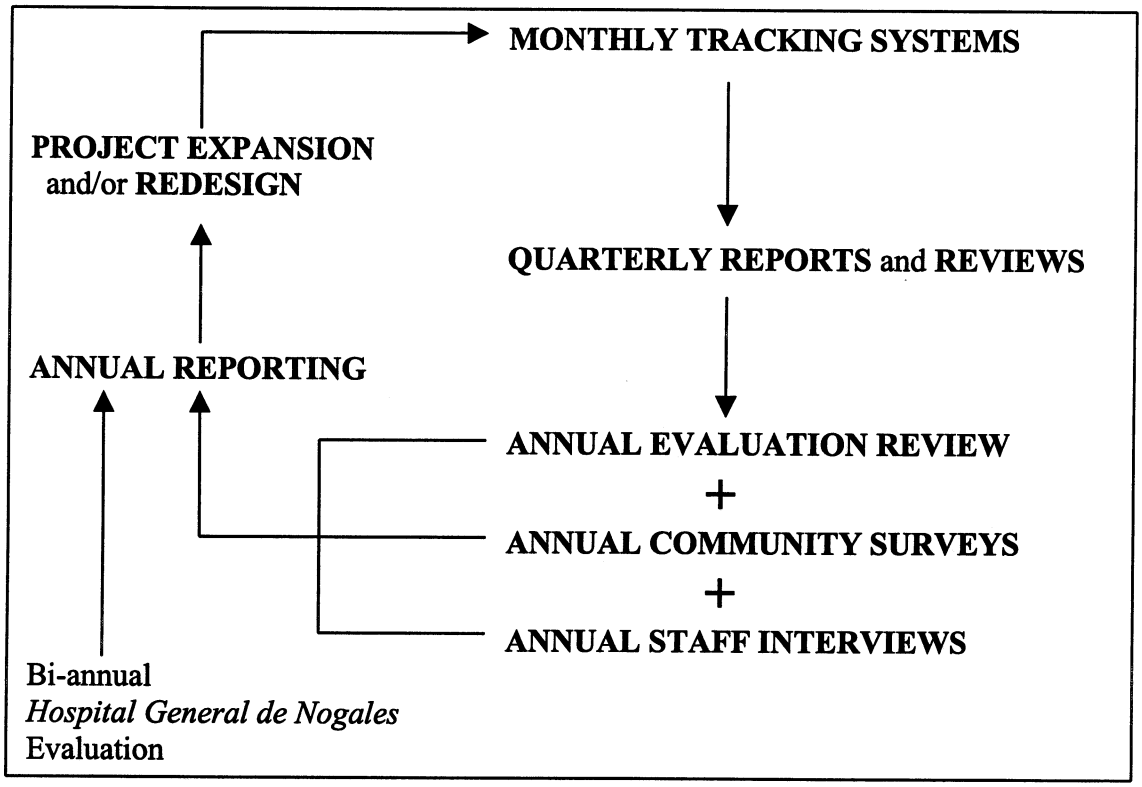


Figure 7. Evaluation process and timeline flowchart

The evaluation model constructed in the previous sections will most efficiently be conducted based upon the evaluation process and timeline flowchart illustrated in **Figure 7.** The existing and potential monthly tracking systems (especially the *Hospital General de Nogales* Center-specific patient and supply tracking system) should be compiled into an electronic database through the ADHS Office of Border Health in Tucson, AZ or *la Oficina de Salud Publica Sonora Arizona* (OSSA) in Nogales, SO. The centralization of data into a single electronic database will provide the most efficient means by which the monthly data can be stored and extracted.

Quarterly reports will consist of a compilation of data from several sources. These sources will include the following:

(1) Three-month reported data extracted from the aforementioned database
(2) The foreign national tracking systems data provided by UMC, TMC, St. Mary's, and Holy Cross Hospitals financial databases
(3) Quarterly reviews of the Nogales Fire Department EMS dispatch and call records.
(4) Results of post-treatment patient satisfaction surveys for the quarter under review

These quarterly reports should be compiled at a central location and provided to the project staff (ie. Dr. Juan Lopez and other Center staff) and Binational Advisory Board members. Review of these reports will provide the necessary information to assess the Center's short-term operations and outcomes data. Quarterly comparisons can be accomplished as the Center continues with operations in the future. Any minor, immediate project adjustments can be accomplished based on analysis of these quarterly reports.

An annual evaluation retreat should be held to provide the necessary setting for a full-scale review of the Center operations over the previous year. The **annual review** will consist of the following compiled annual data:

(1) Monthly and quarterly reports from the Center-specific database for the year under review
(2) Compiled quarterly reports from TMC, UMC, St. Mary's, and Holy Cross financial databases for the year under review
(3) Compiled quarterly reports from emergency services agencies (ie. Nogales Fire Department.
(4) Compiled results of community awareness and perception surveys conducted by the *Rigidoras* will provide annual insight into the progress towards increased awareness of the Center's services and the perception of these services and the community's general opinion on the *Hospital General de Nogales* and the adequacy of trauma/emergency healthcare provided to them by the healthcare infrastructure of Nogales, SO.
(5) Compiled results from staff interviews and surveys
(6) If conducted during that year, the results of the bi-annual (?) *Hospital General de Nogales* evaluation conducted by *la Secretaria de Salud del Estado de Sonora*[*]

Under the direction of a central facilitator, the Center staff and the Binational Advisory Board (and any additional future stakeholders in the project) should analyze the data and compare to established objectives and intended outcomes and impacts. This analysis should be compiled and reported according to the evaluation questions and indicators indicated in the earlier sections of this report. The compiled annual report will ultimately be utilized to assess the Center's project towards meeting its goals and objectives as well as provide a means to convey the success story of the Center to the stakeholders, governments, media, and community.

The annual reporting data will provide a longer-term assessment of the Center's operations and capabilities. Future planning, project expansion, redesign, and improvements for the upcoming year can be generated through analysis of the previous year's reported data. Compilation of baseline data can be accomplished via data sources that were not developed at the time of this report. Based on this baseline data, future

[*] The most recent evaluation was conducted in March 2001. A copy of the results is provided in *Appdendix M.*

annually reported data could be compared to assess movement towards or away from the intended outcomes and impacts of the Center.

Appendix K provides the raw data upon which this report was created as well as a portion of the baseline data available at the time of the writing of this report.

G. Other Recommendations

A few further recommendations for a successful evaluation of the *Centro de Estabilizacion Medica de Nogales, SO*:

(1) To date, no contact has been made with *Cruz Roja* or *Ambulance Vital* regarding data tracking. Since both of these ambulance services are crucial elements of the transfer protocols for trauma/emergency patients in Nogales, Sonora, officials at these agencies should be contacted, and a data tracking system should be implemented. This can be accomplished under a similar mechanism as the one described for Nogales Fire Department in the *Data Sources* section of the evaluation plan.

(2) Consistent collaboration between the Center staff and the *patronato* is key to maintaining community support and consistency in information. *Patronato* leaders should work in conjunction with Center staff, *Rigidoras*, and local media to increase community awareness and disseminate the positive outcomes and stories of success which the Center has accomplished.

(3) As part of the year I annual review, the Binational Advisory Board, in conjunction with Center staff and other stakeholders, should develop concrete objectives based upon the baseline data accrued. These objectives will be similar in nature to the *Outcomes* of the project presented in the project's logic model, but a feasible numerical goal should be implemented into the *Outcomes* to provide a means to show movement towards or away from an established outcome. For example, one of the major outcomes of the project is "decrease trauma/emergency-related mortality rates at *Hospital General de Nogales*."* Based upon baseline data, a numerical projection of the rate can be determined and an objective can be stated as follows: "Decrease trauma/emergency-related mortality rates at *Hospital General de Nogales* from 25 deaths per 1,000 cases to 10 deaths per 1,000 cases."

(4) An essential piece to the successful evaluation is timeliness in and coordination of data collection. Ensure that all data collection is accomplished at appropriate intervals. Ensure that all reporting hospitals are provided sufficient timelines for data reporting.

* See *Short-term Outcomes* in *Appendix E.*

(5) The success of the evaluation also hinges on participation of stakeholders, project staff, and BAB members. To ensure appropriate attendance at quarterly and annual reviews, schedule all quarterly and annual meetings at least 6 months in advance.

(6) Future cost-benefit analysis should be performed after 2-3 years of Center activity.

(7) Trauma-related outcomes research based on ICD-9 coding should be performed after 3 years of Center activity. Please see abstracts in *Appendix L* for reference studies on methodology of trauma-related outcomes research based on ICD-9 coding. Also included in this appendix is a breakdown of ICD-9 codes used for injury-related trauma.

(8) Future epidemiological analysis of trauma and emergency situation in Nogales, SO should be followed through local data gathering efforts as well as comparisons with other reporting agencies. An excellent comparative reference is the Pan American Health Organization's Mortality Profiles of the Sister Communities on the United States-Mexico Border (1992-1994), a summary of which is provided in *Appendix K*. This document is available as a "pdf" file at: http://www.paho.org/English/SHA/mortprofiles-usmb.pdf.

(8) Remember, evaluation can evolve as the project evolves.

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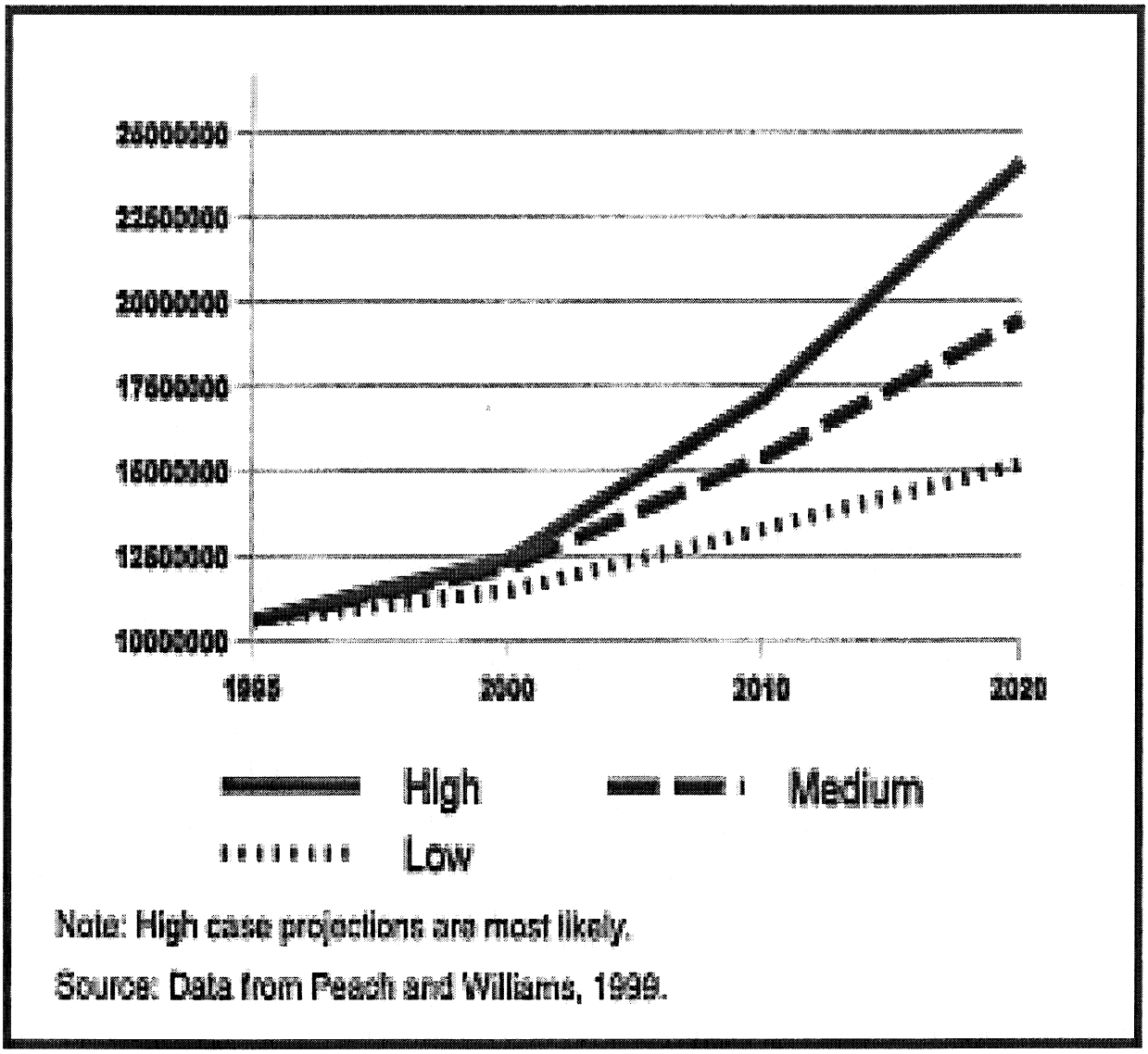
APPENDICES

APPENDIX A:
TABLES AND FIGURES

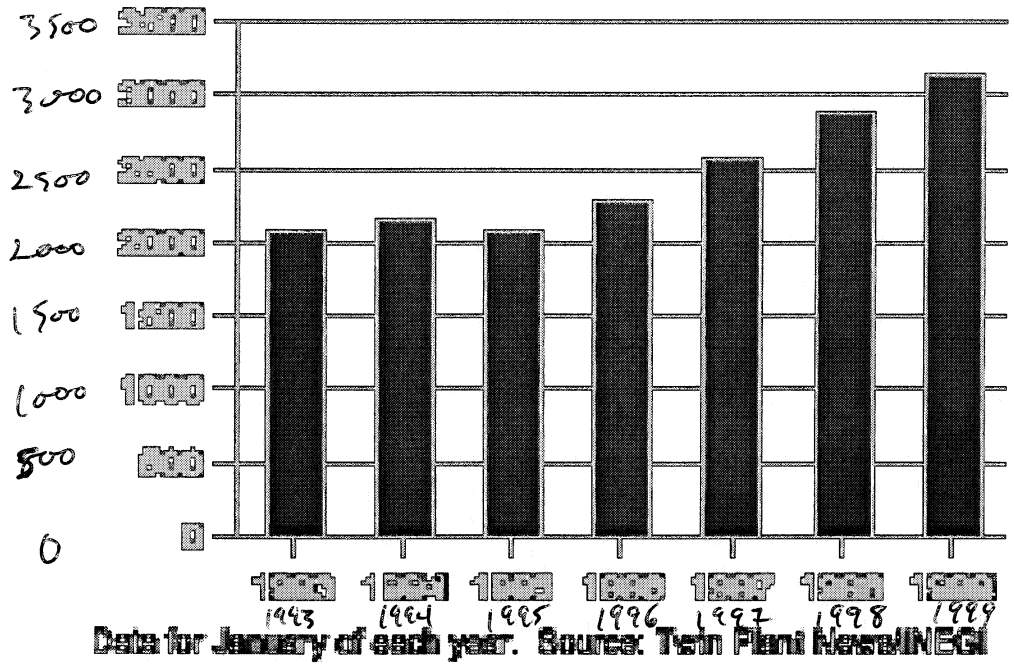
FIGURE A-1: Population Projections for Border Counties and *Municipios*



Note: High case projections are most likely.

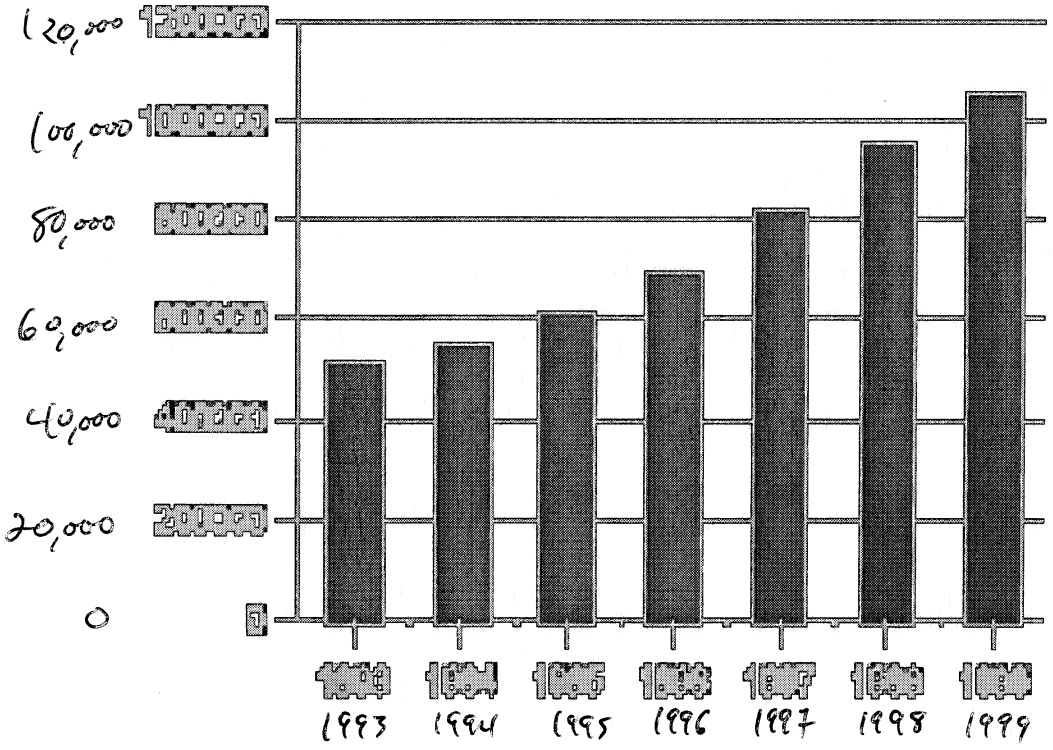
Source: Data from Peach and Williams, 1999.

FIGURE A-2: Growth in *Maquiladoras*, 1993-99[3]



Data for January of each year. Source: Twin Plant News/INEGI

FIGURE A-3: Growth in *Maquiladora* Employees, 1993-99[3]



Data for January of each year. Source: Twin Plant News

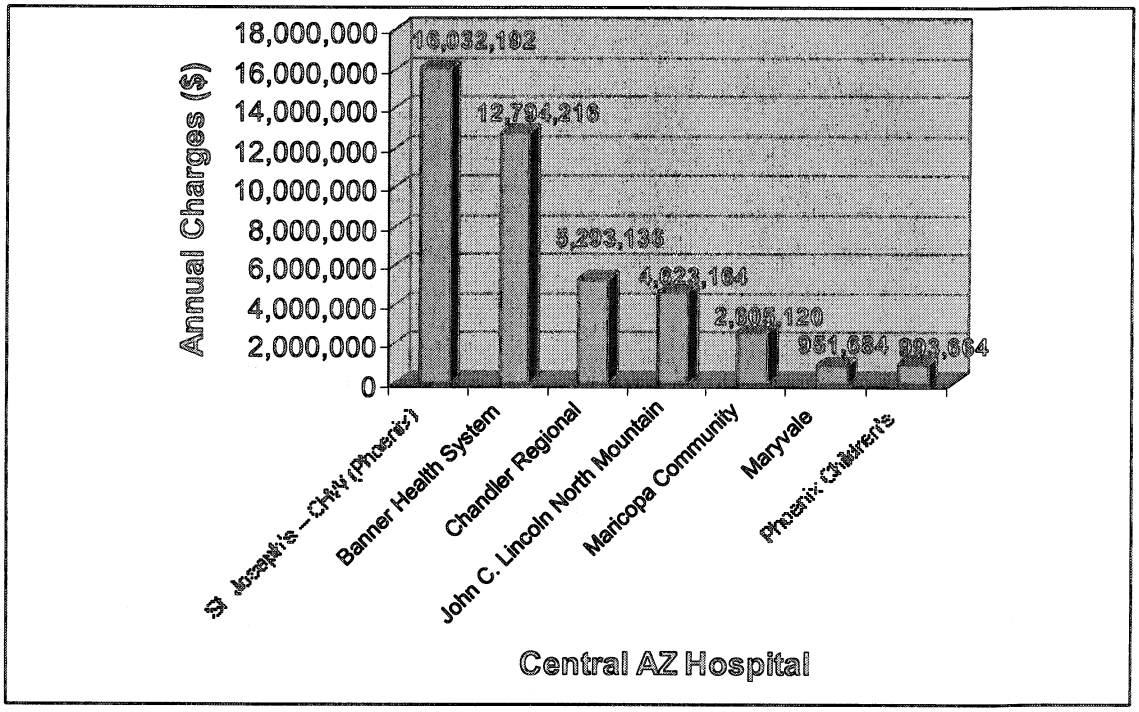
FIGURE A-4: Characteristics of Mexican border municipalities

Area	Population[1]						Income[2]
	2000	Ave. Annual % Change 1990–2000	Percent Change 1990–2000	2010 Projections Low	Med.	High	Minimum Wage (Pesos/day)
Tijuana	1,212,232	6.22	82.20	1,380,392	1,855,867	2,255,833	40.35
Tecate	77,444	5.02	50.21	87,770	100,938	111,022	40.35
Mexicali	764,902	2.71	27.07	924,813	1,000,884	1,057,737	40.35
Baja California Border Municipalities	2,054,578	4.85	48.49	2,392,775	2,957,489	3,424,592	-
Baja California	2,487,700	4.98	49.78	-	-	-	-
San Luis Rio Colorado	145,276	3.14	31.44	183,050	209,237	229,845	40.35
General Plutarco Elias Calles	11,256	1.57	15.71	50,868	44,909	41,123	40.35
Puerto Peñasco	31,101	1.66	16.61				40.35
Caborca	69,359	1.72	17.24	87,399	85,413	84,135	37.95
Altar	7,224	1.19	11.86	9,849	9,590	9,568	37.95
Sáric	2,252	0.66	6.63	3,195	3,045	2,924	37.95
Nogales	159,103	4.74	47.40	190,883	220,591	243,687	40.35
Santa Cruz	1,842	1.12	11.25	1,978	1,542	1,280	40.35
Naco	5,352	1.52	15.22	6,992	6,202	5,652	40.35
Agua Prieta	61,821	5.80	58.03	80,585	124,040	163,510	40.35
Sonora Border Municipalities	494,366	2.31	23.16	614,367	704,569	781,535	-
Sonora	2,213,370	2.14	21.37	-	-	-	-
Janos	10,225	-0.62	-6.18	15,802	12,823	10,708	35.85
Ascensión	21,966	3.36	33.65	26,112	31,771	34,592	35.85
Juárez	1,217,818	5.25	52.51	1,393,175	1,736,020	2,019,075	40.35
Guadalupe	10,016	1.08	10.83	12,138	11,271	10,757	40.35
Praxedis G. Guerrero	6,924	0.57	5.71	13,200	12,149	11,451	40.35
Ojinaga	24,313	0.17	1.69	30,313	25,857	23,170	35.85
Manuel Benavides	1,747	-3.75	-37.47	2,998	1,935	1,393	35.85
Chihuahua Border Municipalities	1,294,809	0.88	8.85	1,495,828	1,833,828	2,111,144	-
Chihuahua	3,047,867	2.48	24.82	-	-	-	-
Ocampo	12,019	5.30	52.97	11,005	8,416	6,842	35.85
Acuña	110,388	9.59	95.95	117,676	182,340	241,486	35.85
Jiménez	9,703	1.76	17.57	12,683	13,058	13,354	35.85
Piedras Negras	127,898	3.03	30.26	161,647	179,008	192,069	35.85
Nava	22,986	3.59	35.89	30,345	33,620	36,435	35.85
Guerrero	2,047	-1.38	-13.77	2,689	2,011	1,611	35.85
Hidalgo	1,442	1.82	18.20	1,726	1,615	1,575	35.85
Coahuila Border Municipalities	286,483	3.39	33.87	337,773	420,266	493,352	-
Coahuila	2,295,808	1.64	16.40	-	-	-	-
Anáhuac	18,501	0.88	8.84	24,433	22,998	22,072	35.85
Nuevo León Border Municipalities	18,501	0.88	8.84	24,433	22,998	22,072	-
Nuevo León	3,826,240	2.35	23.48	-	-	-	-
Nuevo Laredo	310,277	4.14	41.38	375,265	484,575	536,784	40.35
Guerrero	4,370	-0.31	-3.10	5,276	4,025	3,335	40.35
Mier	6,738	0.79	7.91	7,916	7,110	6,552	40.35
Miguel Alemán	25,675	2.04	20.42	30,088	27,521	25,812	40.35
Camargo	18,788	1.15	11.47	19,531	17,432	16,075	40.35
Gustavo Díaz Ordaz	16,223	-0.84	-8.37	19,704	14,061	10,827	40.35
Reynosa	419,776	4.85	48.51	452,720	515,993	563,994	40.35
Río Bravo	103,901	1.05	10.52	135,783	127,636	122,298	40.35
Valle Hermoso	58,292	1.36	13.62	73,520	71,302	69,835	40.35
Matamoros	416,428	3.73	37.30	504,315	567,015	614,403	40.35
Tamaulipas Border Municipalities	1,378,448	1.80	17.97	1,624,396	1,816,670	1,969,747	-
Tamaulipas	2,747,114	2.21	22.12	-	-	-	-
México Border Municipalities	5,527,305	2.28	22.83	6,489,570	7,755,618	8,802,442	-
México	97,361,711	1.99	19.83	-	114,994,753	-	-

*State unemployment rates are annual averages for 1998. Municipality and national rates are annual averages for 1998.
**Percent of the population age 15 years and older who are illiterate.

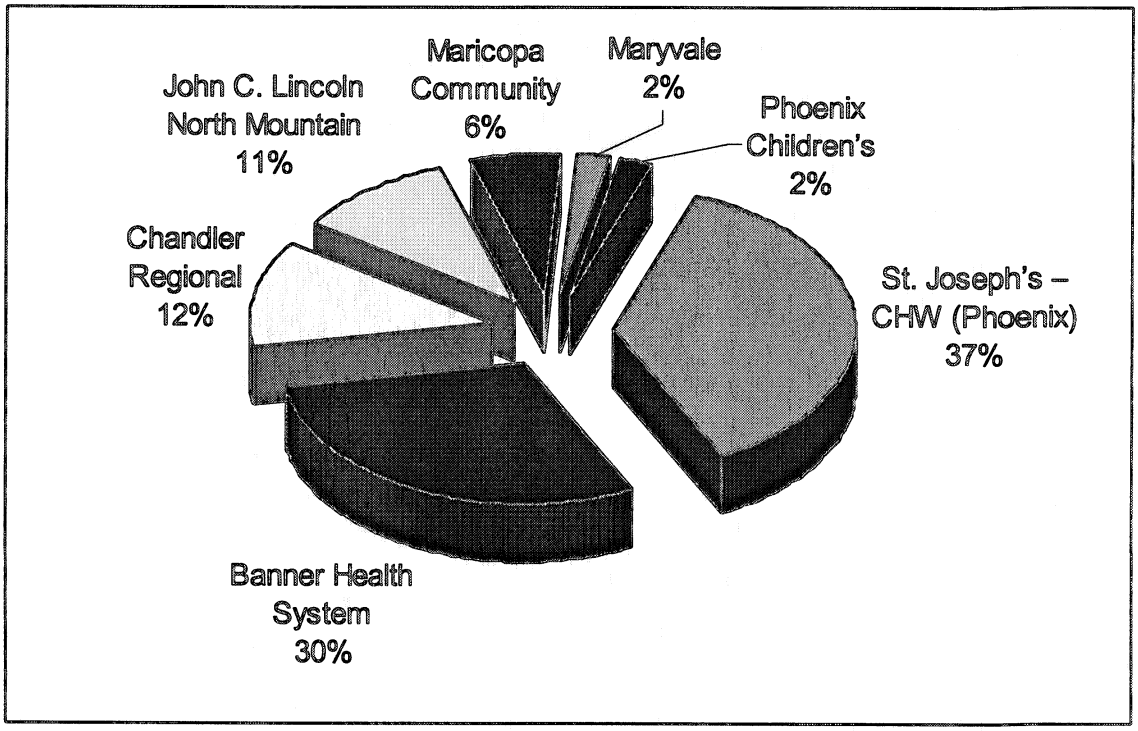
[1] Source: Instituto Nacional de Estadísticas, Geografía, e Informática (INEGI), Southwest Center for Environmental Research & Policy (municipality projections).
[2] Source: Secretaría del Trabajo y Previsión Social (STPS).
[3] Source: Instituto Nacional de Estadísticas, Geografía, e Informática (INEGI); Grupo Financiero Banamex-Accival, División de Estudios Económicos y Sociales.

FIGURE A-5: Annual charges ($) by central AZ hospital for treatment of foreign nationals (2001)[13*]



* Dollar amounts annualized from 3-month reported data for period February 1, 2001 – April 30, 2001
Annualization equation: Annualized charges = 3-month period charges x 4)

Figure A-6: Percentage of annual charges for treatment of foreign nationals by central AZ hospital (2001)[13]



APPENDIX B:
Protocol for Cross-Border Patient Transport

The following informal protocol has been established between *Cruz Roja* Ambulance Service of Nogales, SO, Nogales Fire Department Emergency Medical Services (NFD), and Carondelet Holy Cross Hospital and is routinely employed during the cross-border transport of injured or ill Mexican nationals, or United States citizens in Mexico during time of injury or illness, to the United States:

(1) The patient is transported via local ambulance service (generally *Cruz Roja*) from the Nogales, Sonora hospital or site of trauma/emergency to the Dennis DeConcini United States Port of Entry.
(2) If the patient is a Mexican national, the patient is granted a medical parole by the US Immigration and Naturalization Service (INS).
(3) Nogales Fire Department Emergency Medical Transport is contacted by *Cruz Roja* and the patient is exchanged to NFD care and transported from the Port of Entry to Carondelet Holy Cross Hospital
(4) In accordance with stipulations of the Emergency Medical Treatment and Active Labor Act (EMTALA) of 1986, patients, regardless of insurance coverage, immigration status, or ability to pay are provided stabilizing care at Holy Cross Hospital emergency department.
(5) Depending on the level of emergency or trauma and nationality, one of three situation can occur:
    (a) If patient is considered stable and is a Mexican national, NFD may be called to transport the patient back to the Port of Entry and return to Mexico
    (b) If patient is considered stable and is a US or Mexican citizen, the patient is discharged from the hospital regardless of mode of transport
    (c) If patient requires definitive care above and beyond that which is provided by the Holy Cross hospital and is a US or Mexican citizen, NFD or *Lifeflight*, the emergency helicopter transport service out of St. Mary's Hospital of Tucson, may be contacted to transport the patient to TMC or UMC emergency departments*

*Important to note is that transport for family or friends are not provided by NFD or *Lifeflight*, nor is return transport service from Tucson to Nogales, AZ or Nogales, SO. Therefore, any Mexican citizen brought the United States for care is generally on his or her own if family or friends do not have a mode of transportation to Holy Cross Hospital or Tucson.

APPENDIX C:
Triage and Stabilization Unit Project Proposal Document

March 19, 2002

Dear Colleague:

A partnership was formed approximately one year ago by members of the Health Services Committee of the Arizona-Mexico Commission and the Comisión Sonora-Arizona, to pursue the establishment of a triage and stabilization center for medical emergencies within the Hospital General in Nogales, Sonora, Mexico.

The formation of the partnership was in response to a mandate by the binational community of Ambos Nogales (both Nogales, Arizona and Sonora) to improve access to emergency care by residents of the area. It was also in response to the U.S./Mexico Border Governors' Conference in Tampico, Tamaulipas, Mexico, where improved healthcare services within the border region were recognized as being necessary in support of economic development between the two countries.

The following is a synopsis of this project soliciting your involvement and contributions to the success of this undertaking. We are very optimistic about the future of this endeavor and believe it will serve as a model for other communities within the 2000-mile U.S. / Mexico border area. This is an opportunity for you to contribute, in whatever fashion you wish, to the success of this project. Please contact us by phone or email for further information. We welcome your comments, thoughts, and contributions. The success of this binational collaborative effort will enhance our economic development efforts in the region.

Sincerely,

Robert Guerrero, Co-Chair
Arizona-Mexico Commission
Health Services Committee

Dr. Adolfo Felix, Co-Chair
Comisión Sonora-Arizona
Comité de Salud

Executive Summary

The purpose of this project is to develop and implement a triage and stabilization center for medical emergencies within the public health system in Nogales, Sonora, Mexico, in order to improve access to emergency care by residents of the area. By improving access to emergency health care, the project will address issues that have resulted in Mexican nationals having to rely heavily on the U.S. for emergency medical attention. In addition, Arizona residents can rely on having medical emergency needs met while visiting family, conducting business, or touring the area.

Due to a current lack of border emergency healthcare resources in Nogales, Sonora, Mexico, injured and acutely ill persons from Nogales, Sonora, Mexico are routinely transported to hospitals in the U.S. The patients are granted a medical parole by the U.S. Immigration and Naturalization Service (INS) and directed to the nearest border hospital where they are for the most part referred and transported to a higher level of care facility in Tucson, frequently, but not exclusively, Tucson Medical Center (TMC) and University Medical Center (UMC).

Quality medical care is available in Mexico, but due to a host of reasons including, lack of emergency healthcare resources, the difficulty in obtaining the information regarding medical resources, distance and inadequate emergency medical transport availability to a higher level of care, the Mexican border communities have come to rely on Arizona assisting when medical emergencies arise.

The patients from Mexico are citizens and residents of Mexico; therefore do not meet the residency requirements mandated by Arizona to qualify for financial reimbursement from the state. In an era of decreased financial reimbursements from government entities, health care institutions in Arizona can no longer afford to provide medical care.

The overarching goal of the project is better coordination and upgrading care available in the Arizona-Sonora border which will reduce the number of critically ill persons crossing the border seeking medical care. For residents of Arizona and other parts of the United States requiring emergency medical care, the goal is to assure quality triage and stabilization and transport to Arizona hospitals. Residents requiring emergency care will receive the right care, in the right place at the right time. The care will be delivered in the most appropriate setting, it will be technically proficient, in a cost effective environment without compromising the level and quality of care. Emergency medical care will meet the needs of everyone involved, especially the patient and respective families.

NAME	INSTITUTION	ADDRESS	TELEPHONE NUMBER
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Mrs. Barbara Swanson Felix, Coordinator International Patient Services	University Medical Center	1501 N. Campbell Room 2418-B Tucson, AZ 85724	(520) 694-4412 (520)0694-4085 fax bfelix@umcaz.edu
Mr. Robert Guerrero Co-Chair, Health Services Committee	Arizona-Mexico Commission C/o Tucson Medical Center	5301 E. Grant Rd. Tucson, AZ 85712	(520) 324-1953 (520) 324-1941 rguerreroaz1@aol.com
Mr. José Robles, Coordinator, International Services	Tucson Medical Center	5301 E Grant Rd. Tucson, AZ 85712	(520) 324-1938 (520) 324-1941 jose.robles@tmcaz.com
Mr. Danny Valenzuela, Deputy Director	Arizona Department of Health Services USMBHC- Arizona Delegate	1740 W. Adams St. Phoenix, AZ 85007	(602) 542-1038 (602) 542-1062 fax
Dr. Cecilia Rosales Chief, Office of Border Health	Arizona Department of Health Services	4949 E. Fifth Street Tucson, AZ 85711	(520) 795-1531 (520) 795-1816 fax
Mr. Bruce Norton, Chief Financial Officer	University Medical Center	1501 N. Campbell Tucson, AZ 85724	(520) 694-4082 bnorton@umcaz.edu
Marge Sisson, Director Transition Management	University Medical Center	1501 N. Campbell Tucson, AZ 85724	(520) 694-2729 (520) 694-2014 msisson@umcaz.edu
Scott G. Floden, Hospital Administrator	Kino Community Hospital	2800 E. Ajo Way Tucson, AZ	(520) 573-2894
Dr. Mercedes Gameros, Coordinadora	Oficina Binacional de Salud Sonora-Arizona Secretaria de Salud de Sonora	P.O. Box 1192 Nogales, AZ 85628	01152 (631) 3137928
Dr. Enrique Davis Director	Hospital General de Nogales	#1277 Dr. Francisco Arriola Nogales, Son. 84000 Mexico	01152 (631) 3130671
Dr. Juan López, Project Coordinator	Hospital General de Nogales	#1277 Dr. Francisco Arriola Nogales, Son. 84000 Mexico	01152 (631) 3133465
Lic. Juan Hurtado, Administrator	Hospital General de Nogales	#1277 Dr. Francisco Arriola Nogales, Son. 84000 Mexico	01152 (631) 3133460
Dr. Marcos Serrato Director	Trauma Center, Hospital General del Estado de Sonora	Blvd. L. Encinas s/n Hermosillo, Son. 83000 Mexico	01152 (662) 2132556 01152 (662) 2590959
Mr. Rich Polheber CEO	Holy Cross Hospital	1171 W. Target Range Rd. Nogales, AZ 85621	(520) 285-3000

PROJECT PROPOSAL

EMERGENCY MEDICINE PILOT IN NOGALES, SONORA MEXICO

Collaborating Organizations:
University Medical Center
Kino Community Hospital
Holy Cross Hospital
Tucson Medical Center
Hospital General de Nogales, Sonora
Hospital General del Estado de Sonora
Hospital Infantil del Estado de Sonora
Arizona Department of Health Services
Secretaria de Salud del Estado de Sonora
Comisión Sonora-Arizona, Comité de Salud
Arizona-Mexico Commission, Health Services Committee
Arizona Delegation to US Mexico Border Health Commission
Sonora Delegation to US Mexico Border Health Commission

TO OBTAIN FUNDING FOR THE PROJECT

Objective:
The project objective is to establish a triage and stabilization unit for medical emergencies within the public health system in Nogales, Sonora, Mexico.

Reasons:
Currently, Nogales, Sonora lacks adequate border emergency healthcare resources as demonstrated by numbers of individuals crossing the international border seeking care. There are serious concerns with respect to time lapse prior to patients receiving adequate medical attention resulting in delays and poor outcomes. In addition, inefficient use of monies is being expended.

Requirements:

- Adequate physical plant
- Adequate staff, equipment and supplies.
- Unit to function twenty-four hours per day, seven days per week (24/7).
- Adequate transport system for those individuals that require transfer to a higher level of care in Mexico.
- Adequate communications system.
- Buy-in of both private and public healthcare providers in Northern Sonora and Southern Arizona, as well as both state governments.
- Commitment of the community. (*Patronato)*
- Initial orientation and training along with continuous training and supervision.

EMERGENCY MEDICINE PILOT IN NOGALES, SONORA MEXICO

PROBLEM STATEMENT

Injured and acutely ill persons from Nogales, Sonora, Mexico are routinely transported to hospitals in the US. Patients are granted medical paroles by the U.S. Immigration and Naturalization Service and directed to the nearest border hospital where they are then most often sent to higher level of care institutions in Tucson, frequently, but not exclusively, Tucson Medical Center (TMC) and University Medical Center (TMC). These individuals as residents of Mexico are not eligible to access financial programs in the United States. Financial programs cover the cost of the medical services provided to the uninsured. Hospitalizations are often long and follow-up care is difficult to arrange. The financial impact on the patients' families is devastating and, frequently, hospitals are left with no recovery of funds expended. At a time when financial reimbursement from government entities is decreasing, U.S., and Arizona hospitals in particular, can no longer afford to absorb these costs. It is necessary to consider all means of utilizing the limited resources available in a more efficient manner.

The population continues to increase in the US-Mexico border region and yet healthcare services are either not available or are fragmented. Communication is difficult and frequently, information on available medical resources in the state of Sonora is not easy to obtain. Increasing integration of US and Mexican cultures and economies (NAFTA) is expected to aggravate problems in the delivery of emergency medical services within the border region.

Quality medical care is available in Mexico, but difficulty in obtaining information regarding medical resources leads to a lack of knowledge, by both public and private professionals in the medical field. An important reason why patients are sent to the United States is distance and inadequate emergency medical transport availability. For example, Hermosillo, Sonora is a 3-hour ground ambulance ride from Nogales, Sonora, while Tucson is a 30-minute helicopter ride. Another important factor that comes into play is tradition, "we've always done it this way".

PURPOSE STATEMENT WITH PRINCIPLES FOR SOLUTION

There is an important need to establish effective collaborative working relationships between Arizona Hospitals, Sonora Hospitals, the Arizona Department of Health Services, its counterpart, Secretaria de Salud en el Estado de Sonora, the United States-Mexico Border Health Commission (Arizona and Sonora Delegations), la Comisión Sonora-Arizona, its counterpart, the Arizona Mexico Commission. This collaborative effort will lead to the development of alternative methods for the care of Mexican patients currently being transferred to the U.S. for emergency medical care. The goal will be to reduce the number of critically ill persons crossing the border to seek medical care in the US while better coordinating and upgrading the care available in their own country.

In addition, it assures adequate care for Arizona and US residents touring, conducting business, and visiting family in Mexico, which at any moment may require medical emergency care. The overarching goal is that residents receive the right care, in the right place, at the right time. Healthcare will be delivered in the most appropriate setting; it will be technically proficient and

culturally appropriate. Medical attention will be offered in a cost-effective environment without compromising quality of care.

The project will focus on the Nogales, Sonora / Nogales, Arizona area. In order to resolve the problem stated it is imperative that a strategy be formulated to reduce the number of patients transported from the Nogales port of entry to the U.S. healthcare facilities in Arizona. Governor Lopez Nogales of Sonora and Governor Hull of Arizona have identified this region as a combined economic region and the attendant CANAMEX highway will pass through the Nogales Port of entry.

Both TMC and UMC have had the positive experience of working with the Secretaria de Salud del Estado de Sonora, the Hospital Integral in Agua Prieta and the Hospital Infantil del Estado de Sonora in Hermosillo in putting together the NEOVIDA-AGUA PRIETA project. This is a project for sick and premature neonates; the same formula is being proposed for the triage and stabilization unit in Nogales, Sonora, Mexico. Although the project will have a much broader focus, the use of the name carries a success story and speaks of valuable experience.

The proposed strategy has been discussed with some anticipated participants on both sides of the border and a binational project established for a specific period of time would appear to be an appropriate vehicle. Administration of the project would fall to the Binational Advisory Board comprised of individuals from participating institutions in the project.

The Binational Advisory Board will have, as it's primary responsibilities:

- Approving work plans
- Placing authority
- Setting annual objectives
- Reviewing and approving budgets
- Designating responsibilities
- Supervision of the Project Coordinator

The Secretaria de Salud del Estado de Sonora will designate the medical facility and personnel responsible for staffing and operating the unit. That office will also appoint the Project Coordinator.

The Project Coordinator will be responsible for the following:

- Administration and ongoing development of the project in conjunction with the Binational Advisory Board.
- As necessary, will be responsible for elaborating work schedules to assure 24 hour, seven day a week (24/7) coverage.
- Ensure the availability of properly maintained equipment and supplies.
- Ensure proper contact and referral procedures in arranging transport for patients requiring transfer of care to a higher-level hospital in Mexico.
- Arrange for continuing medical training for medical personnel staffing the unit; this will be coordinated with participating institutions within the Binational Advisory Board.
- Be available to work with the local citizens group (*Patronato)* in fund raising activities within the Nogales, Sonora community in support of the unit.

HISTORICAL DATA ILLUSTRATING FINANCIAL IMPLICATIONS

University Medical Center
From July 1, 1999 through June 30, 2000, 285 non-Arizona residents were admitted to UMC from the US-Mexico border region. Their hospital bills totaled $7,393,240. Payments on those accounts amounted to $40,769 at the time the patient was discharged from the facility.

From July 1, 2000 through June 30, 2001, 257 non-Arizona resident patients were seen at UMC from the US Mexico border region. The hospital bill for care provided these individuals totaled $6,610,502 with payments received at the time of discharge of $161,881. Experience has shown that very little reimbursement is collected once the person leaves the hospital.

Tucson Medical Center
In 2001, TMC reported to the Arizona Hospital and Healthcare Association a total of $2,760,144 in billed charges resulting from non-Arizona resident foreign nationals. Of interest is that 60% of the uncompensated care provided by TMC came from patients that were granted humanitarian medical paroles by the U.S. Immigration and Naturalization Service.

Holy Cross Hospital
In the past year, Holy Cross estimates that approximately $850,000 has been used in providing care to non-Arizona resident patients.

Arizona Hospital and Healthcare Association
In the past year, the Arizona Hospital Association estimates $ 44,100,176 has been provided in uncompensated care to non-Arizona resident patients.

The changing situation as to financial reimbursement provided for services, makes it imperative that a shift from a passive position to a proactive position be taken in regards to patients being transferred north via the Nogales ports of entry.

Because the Sonoran Secretaria de Salud is willing to work with us in solving this problem, a joint binational effort will make it possible for Mexican citizens to receive quality care within their own country resulting in a decrease in uncompensated care in the U.S.

It is extremely difficult to estimate cost savings to the Arizona hospitals with the implementation of this project. However, in the 28 months that NEOVIDA-AGUA PRIETA has been in operation, TMC and UMC have seen a marked drop in the number of infants entering the U.S. for medical care. During the first year, there were still 11 babies that came to UMC. In the second year only 2 arrived and in the past 5 months, none. Even more impressive is the fact that over 300 infants have received care in the Agua Prieta unit and the infant mortality dropped from 17% to 2% during the first year of operation. A TMC neonatologist's, who was very instrumental in founding NeoVida-Agua Prieta, made an unannounced visit to the unit recently and reported the quality of care had improved, dramatically.

Based on this experience, it is reasonable to achieve a 50% reduction in costs to Arizona hospitals. In Agua Prieta, raising community awareness regarding the capabilities of NeoVida-Agua Prieta will take time and success will be the best method of informing the public.

(Table A budget estimate for one year)

NOTES

Progress of the project will be monitored for three years during. Evaluation and modifications to the project will be ongoing. We expect the unit becomes self-sufficient through local community support.

At this time, the Secretaria de Salud del Estado de Sonora has completed remodeling of the Hospital General in Nogales, Sonora. Hospital personnel have received Advanced Trauma Life Support and Advanced Cardiac Life Support training. Advanced Pediatric Life Support training is scheduled to take place in the very near future. These courses are part of the Continuing Medical Education sponsored by UMC in Mexico and were financially supported by the Arizona Department of Health Services.

With the help of Dr. Marcos Serrato, who chairs the trauma department unit at the Hospital General del Estado de Sonora in Hermosillo, an equipment list was formulated and price quotes obtained from International Medical Equipment in Tucson. Dr. Serrato and his team will be supervising the unit in Nogales, medically, and coordinating with the Project Coordinator when transports are indicated. (Table B equipment list)

Contracts need to be developed similar to those already in place for NeoVida-Agua Prieta covering the relationship between the US and Mexican participants. All employees involved in the operation of the Unit in Nogales will be under the Secretaria de Salud del Estado de Sonora.

Expansion of the accounting policies and procedures that already exist for NeoVida-Agua Prieta, will cover the Nogales project.

(Addendum: Recommendation presented by the co-chairs of the Arizona Mexico Commission and the Comisión Sonora Arizona to the Governors of Arizona and Sonora.)

Exhibit A

NOGALES PROJECT		
	US Dlls.	
Physician's Education	Monthly	Annually
Transportation/Transportación:	$ 25	$ 300
Lodging/Hospedaje:	$ 100	$ 1,200
Meals/Alimentos:	$ 25	$ 300
Subtotal:	$ 150	$ 1,800
Nursing Education		
Transportation/Transportación:	$ 20	$ 240
Lodging/Hospedaje:	$ 100	$ 1,200
Meals/Alimentos:	$ 10	$ 120
Subtotal:	$ 130	$ 1,560
EQUIPMENT SUPPLIES & MEDICATION		
Adult Medical Emergency Triage & Stabilization Equipment	n/a	$ 90,491
Neonatal Equipment	n/a	$ 64,421
Equipment Maintanance	$ 500	$ 6,000
Supplies and Disposables Allowance	n/a	$ 30,000
Medication	$ 600	$ 7,200
Subtotal:	$ 1,100	$ 198,112
Transport (based on 1.5 transport per month)	$ 1,350	$ 24,300
Legal/Accounting Svcs.		
Legal/Legales	$ 50	$ 600
Administrative/Administrativo - Accounting/Contables	$ 500	$ 6,000
Subtotal:	$ 550	$ 6,600
Total	$ 3,280	$ 232,372

Exhibit B

NOGALES ADULT EMERGENCY CENTER					
EQUIPMENT	MANUFACTURER	MODEL	QTY	UNIT PRICE	Total
Anesthesia Machine	Draeger	NarcoMed 2A, 2 Vaporizers (Halothane & Isoflorane), Absorber, Ventilator, Flowmeters	1	$ 8,500	$ 8,500
Surgical Table	AMSCO	2080M, Manual	1	$ 4,000	$ 4,000
Code Cart			1	$ 550	$ 550
Defibrillator	Physio Control	LP8P, with Pace Maker	1	$ 2,800	$ 2,800
Defibrillator	Physio-Control	LP-6	1	$ 1,600	$ 1,600
Emergency Room Lights	Burton	Dual, Outpatient	1	$ 2,000	$ 2,000
Guerneys			5	$ 550	$ 2,750
Wall Mounted BP Units	Baum		5	$ 85	$ 425
Autoclave	Pelton Crane	Magna-Clave	1	$ 7,500	$ 7,500
X-Ray View Box		Dual	2	$ 450	$ 900
Monitor	Propac	102 with Capnograph, ECG+NIBP+SaO2 + CO2 with battery (portable)	2	$ 4,900	$ 9,800
Monitor	Propac	102 ECG+NIBP+SaO2 con Bateria (Portatil)	1	$ 3,800	$ 3,800
Monitor	Spacelabs	90303B, ECG+NIBP+SaO2+Temp	1	$ 2,500	$ 2,500
Oxygen Tanks+Regulator, E-size with cart			4	$ 195	$ 780
Pulse Oximeter	Nellcor	N-100	2	$ 800	$ 1,600
Set of Laryngoscopes, sizes 1,2,3,4	Welch Allyn		1	$ 800	$ 800
Suction Machines	Gomco		2	$ 250	$ 500
Ventilator, adult + infant	Siemens	900C	3	$ 6,500	$ 19,500
Trays & Equipment	Various	Various	N/A		$ 10,186
X-Ray Developer	Kodak		1	$ 4,500	$ 4,500
X-ray, Portable	GE	AMX	1	$ 5,500	$ 5,500
Total Equipment				$ 57,780	$ 90,491

Exhibit C

Nogales Neonate Center					
EQUIPMENT	MANUFACTURER	MODEL	QTY	UNIT PRICE	Total Price
BP Units Wall mounted units			1	$ 85	$ 85
Centrifuge	Clay Adams	Hematocrit	1	$ 950	$ 950
Surgical Equipment	Various	See Equipment List	N/A	N/A	$ 10,186
Surgical Lamps	AMSCO	Polaris, Dual	1	$ 4,800	$ 4,800
Transport Incubator, with ECG+NIBP+SaO2+ O2 sensors+ Ventilator+ 2 infusion pumps+ Oxygen blender + 02 tank(2)			1	$ 22,000	$ 22,000
Pediatric Scale	Healthometer		1	$ 195	$ 195
Infant Incubators	Air Shields	C-86	4	$ 1,200	$ 4,800
Infant Warmer	Ohio	Neonatal Care Unit	2	$ 1,200	$ 2,400
Infusion Pumps	IMED, Neonatal	PC	2	$ 700	$ 1,400
Stethoscope	Littman	Classic	2	$ 95	$ 190
Monitor, Non-Invasive Blood Pressure	Datascope	Accutor 1 without Printer	1	$ 350	$ 350
Monitor	Spacelabs	90303B, ECG+NIBP+SaO2+Temp	1	$ 2,500	$ 2,500
Monitor	Propac	102 with Capnograph, ECG+NIBP+SaO2 + CO2 with battery (portable)	1	$ 4,900	$ 4,900
Humidifier	Fisher Pakell	MR-630	2	$ 500	$ 1,000
Humidifier	Water Containers	15/box	2	$ 400	$ 800
Laryngoscopes, set of size 0 & 00 with handle	Welsh Allyn		1	$ 650	$ 650
Ventilators	Bear	Cub	2	$ 1,700	$ 3,400
Oxygen and Air Connections to Wall Outlets		Various			$ -
Oxygen Monitor			1	$ 500	$ 500
Oxygen Regulator / flowmeter			2	$ 65	$ 130
Oxygen Tanks with regulators	E-size		5	$ 85	$ 425
Ped Oxygen Hoods	Nascor	Neonatal	2	$ 300	$ 600
Aspirators	Gomco		2	$ 250	$ 500
Pressure Gauges, Air and Oxygen		Various			$ -
Pulse Oximeters	Nellcor	N-100	2	$ 800	$ 1,600
Resuscitation Bag			1	$ 60	$ 60
				$ 44,285	$ 64,421

Exhibit D

Surgical Supplies

Equipment	Brand	Model	Specifications	Price	Quantity	Total
Mayo Tray	Mabis	49-363-000	19-1/8"x 12-5/8"x34	$46.00	5	$230.00
Medium Basin	Completa	5750	12-x5/8" 7-x5/8"x34	$41.00	5	$205.00
Small Basin	Completa	5749	8.5x3"x1.5	$35.00	5	$175.00
Pean Forceps, Curved	Miltex	7 38		$42.50	5	$212.50
Needle Holder	Miltex	8 44		$60.10	5	$300.50
Scalpel Handle	Miltex	4 7R		$6.90	5	$34.50
Dissection Forceps	Miltex	6 42	R/L Handed	$17.90	5	$89.50
Dissection Forceps	Miltex	6 2	R/L Handed Large	$15.50	5	$77.50
Mayo Scissors	Miltex	5 120	Straight	$45.20	5	$226.00
Pean Forceps, Curved	Miltex	7 112	Curved	$65.60	5	$328.00
Syringe	Mabis	43 455 000	10/cc	$15.00	5	$75.00
Jars	Mabis	39 802000	set of 5 clear glass	$30.00	5	$150.00
Pean Forceps	Miltex	7 138	Curved	$52.50	5	$262.50
Scalpel Handle	Miltex	4 7	#3	$13.20	5	$66.00
Kelly Forceps	Miltex	7 36	Straight	$40.60	5	$203.00
Mosquito Clamps	Miltex	7 2	Straight	$40.20	5	$201.00
Mosquito Clamps	Miltex	7 14	Curved	$41.30	5	$206.50
Needle Holder	Miltex	8 4	Small	$66.40	5	$332.00
Adson Clamp	Miltex	6 114	R/L Handed	$25.60	5	$128.00
Separator	Miltex	11 110	faraeuf small	$55.22	5	$276.10
Separator	Miltex	11 76	senn miller	$43.80	5	$219.00
Pean Forceps	Miltex	7 138	Curved	$52.20	5	$261.00
Dissection Forceps	Miltex	18 840	4 1/2t	$52.80	5	$264.00
Mayo Scissors	Miltex	5 120	Straight	$45.20	5	$226.00
Finochet Separators	Miltex	25 104	medium #10	$632.70	5	$3,163.50
Metzembaum Scissors	Miltex	5 184	Large Curved	$80.25	5	$401.25
Scalpel Handle	Miltex	4 8	#-4	$13.20	5	$66.00
Dissection Forceps	Miltex	6 14	R/L Handed Large	$28.10	5	$140.50
Vascular Clamp	Miltex	24 1150	Debackey	$215.10	5	$1,075.50
Needle Holder	Miltex	8 46	Large 7"	$66.20	5	$331.00
Aseptic Forceps	Miltex	7 120	Pean Straight	$51.90	5	$259.50
						$10,185.85

APPENDIX D:
Healthy *Gente* 2010 Project
Budget Document

ARIZONA - HEALTHY GENTE 2010 PROJECTS

Workplan for Year 2002
Total Amount Requested: $72,190.00 *Local In-Kind Contributions: $316,000.00*

Healthy Gente 2010 Major Goals:
(1) To increase and improve the quality and years of healthy life
(2) Eliminate health disparities

Projects:

EMERGENCY MEDICINE PILOT IN NOGALES Healthy Gente Priority: 1.- Increase Access to Care Disparity to be addressed: Reduce the proportion of persons lacking access to medical care providers in underserved areas Reduce the distance to hospitals and provide adequate transport availability to a higher level of care. Target Population: Injured and acutely ill persons with residency in Mexico or US/AZ residents requiring emergency care. Responsible Agencies: University Medical Center, Tucson Medical Center, Secretaria de Salud de Sonora, Arizona Department of Health Services, US – Mexico Border Health Commission Fiscal Organization: Oficina de Salud Publica Sonora Arizona (OSSA)	Goal The goal will be to reduce the number of critically ill persons crossing the border to seek medical care in the US while better coordinating and upgrading the care available in their own country. In addition, it assures adequate care for Arizona and US residents touring, conducting business, and visiting family in Mexico, which at any moment may require medical emergency care. The overarching goal is that residents receive the right care, in the right place, at the right time. Objective: To work in collaboration with Holy Cross Hospital, Tucson Medical Center (TMC), University Medical Center (UMC), el Hospital Infantil del Estado de Sonora, Hospital General del Estado de Sonora, and Hospital General de Nogales, the Arizona Department of Health Services, la Secretaria de Salud del Estado de Sonora, the United States – Mexico Border Health Commission (Arizona and Sonora Delegation), the Arizona Mexico Commission, Comisión Sonora Arizona and other hospitals in Arizona and Sonora to develop alternative methods for the care of patients residing, visiting and working in the community of Ambos Nogales. Strategy: A binational project established for a specific period of time is appropriate for this project. Administration will fall on the Binational Advisory Board comprised of individuals from participating institutions in the project. The Binational Advisory Board will have the following primary responsibilities: Approving work plans, setting annual objectives, designating responsibilities, placing authority, reviewing and approving budgets and supervision of project coordinator. The Secretaria de Salud will name the Project Coordinator. Project Coordinator will be responsible for the administration and ongoing development for the project in conjunction with the Binational Advisory Board. Will be responsible for elaborating work schedules to assure 24/7 coverage for the unit as well as availability of properly maintained equipment and supplies as needed. Will ensure proper contact and referral procedures are followed in arranging transport for patients that require transfer of care to a higher level hospital. Project coordinator will arrange for ongoing medical training to take place for the persons staffing the unit; will be available to work with the local citizens group in fund raising activities. Project Description: Following a priority setting agenda in the Ambos Nogales community, a quality improvement team was established to address the need to upgrade services provided to border residents, and to insure prudent utilization of existing limited resources available in the Arizona emergency medical services system. The quality improvement team is comprised of a strong private/public partnership consisting of Holy Cross

	Hospital in Nogales Arizona, University Medical Center and Tucson Medical Center, in collaboration with the Secretaria de Salud Publica de Sonora and the Arizona Department of Health Services. Renovation and incorporation of this unit within the Hospital General in Sonora, the designation and training of personnel in Advanced Cardiac and Trauma Life Support and supervision of Medical Staff is provided by the Secretaria de Salud Publica de Sonora. In addition a local board of Directors will oversee and support the unit and its personnel.
	Evaluation: Evaluation plan in progress. To the date, a University of Arizona public health/medical student accepted an internship with the ADHS/ Office of Border Health to develop and implement an evaluation component. Intern will be under the guidance and supervision of an evaluation team that includes ADHS/Office of Border Health, UofA College of Public Health, Hospital General, Tucson Medical Center and The Arizona Sonora Binational Public Health Office. **Target Dates:** Completion of model for evaluation plan: May 2002 Inauguration of Unit: March 2002

Budget Description:

	Actual (US Dlls)		Healthy Gente Budget Request
Physician's Education	**Monthly**	**Annually**	
Transportation	$ 25	$ 300	
Lodging	$ 100	$ 1,200	
Meals	$ 25	$ 300	
Subtotal:	$ 150	$ 1,800	1,800.00
Nursing Education			
Transportation	$ 20	$ 240	
Lodging	$ 100	$ 1,200	
Meals	$ 10	$ 120	
Subtotal:	$ 130	$ 1,560	1,560.00
EQUIPMENT SUPPLIES & MEDICATION			
Adult Medical Emergency Triage & Stabilization Equipment	n/a	$ 107,005	
Neonatal Equipment	n/a	$ 59,000	
Equipment Maintanance	$ 500	$ 6,000	6,000.00
Supplies and Disposables Allowance	n/a	$ 30,000	
Medication	$ 600	$ 7,200	
Subtotal:	$ 1,100	$ 209,205	
Transport (based on 1.5 transport per month)	$ 1,350	$ 24,300	9,040.00
Legal/Accounting Svcs.			
Legal	$ 50	$ 600	600.00
Administrative	$ 500	$ 6,000	6,000.00
Subtotal:	$ 550	$ 6,600	
Total	$ 3,280	$ 243,465	25,000.00

Inkind Contributions:

Secretaria de Salud-Remodeling of existing structure/Project Coordinator:	150,000.00
Tucson Medical Center- staff time	25,000.00
University Medical Center-staff time	50,000.00
ADHS-staff time	15,000.00
Holy Cross Hospital-equipment	20,000.00
U of A College of Public Health(TA/Evaluation/Intern Student)	20,000.00
Hospital General de Nogales-equipment	10,000.00
Total	290,000.00

APPENDIX E:
Program Implementation Logic Model Worksheets

RESOURCES

- Binational Advisory Board (BAC):
  - Subgroup of the Binational Health Council developed at Healthy Gente 2010 Summit of 2001
  - Planning, development, and oversight
  - Members: (see attached project proposal)
  - Organizations: (see attached project proposal)
  - Advantages: diversity, bilingual, binat'l representation to foster full support and buy-in to project
- Preexisting Neovida-Agua Prieta model for reference and support
- *Hospital General de Nogales, SO*:
  - Project site – refurbished, redesigned
  - Project staff – doctors/nurse/ancillary for 24/7 coverage
  - Project Coordinator – Dr. Juan Lopez
- ATLS, ACLS, PALS, NALS CME training in Mexico sponsored by UMC/TMC
  - Partial funding by UMBHC
- Project proposal and power point presentations to assist in gaining financial backing
- Existing success stories (ie. prison riot, twins, Nolvia's grandmother)
- Media coverage to garner community awareness and *patronato* binationally
- Availability of quality ambulance services binationally
  - Nogales FD
  - Cruz Roja – for transport from GPOE to Hospital General
  - Vital - for transport to Hermosillo
- Communication infrastructure b/t hospitals in Nogales, AZ; Nogales, SO, and Hermosillo, SO
  - Dedicated phone line b/t Nogales, SO and Hermosillo
- Existing support:
  - $25,000 from AzMBHC – funds training costs, equipment maintenance, legal and accounting services
  - Equipment donated from Holy Cross ($20,000)
  - Agua Prieta *patronato* – assisting in development of Nogales, SO community support
  - Governmental support and endorsement
    - Secretaria de Salud del Estado de Sonora and ADHS
    - Governors Armando Lopez Nogales and Jane Hull
    - Ayuntamiento de Nogales, SO
    - Consulates
  - Real and potential financial and in-kind support binationally from area hospitals, agencies, foundations, charities, etc
- planned 1st year budget ($290,000 US) – real and in-kind

ACTIVITIES

- Establish binational collaborative coalition as mandated by HG 2010 Summit of 2001
  - Recruit members of BAB and evaluation team
  - Utilize preexisting binational support coalitions and models (ie. Neovida-AP) to garner binational support for project
  - BAB activities:
    - Approve work plans
    - Place authority
    - Set annual objectives
    - Review/approve budget
    - Designate responsibilities
    - Supervise Project Coordinator
- Marketing activities:
  - Develop project proposal document and mailing
  - Develop power point presentation and actively present to funding sources
  - Target marketing efforts to major stakeholders (ie. UMC, TMC, INS)
  - Assist Project Coordinator to establish *patronato*
  - Market to community to enhance awareness and perception of services
- Train *Hosp General de Nogales* staff to handle increased case load and types of cases
- Hire new staff to maintain 24/7 coverage
- Secretaria de Salud del Estado de Sonora activities:
  - Designate facility and personnel – remodel, equip, expand
  - Appoint Project Coordinator
- Project Coordinator (Dr. Juan Lopez) activities:
  - Administration and development of project in collaboration with BAB
  - Elaborate work schedule to ensure 24/7 coverage
  - Ensure availability of properly maintained equipment/supplies
  - Ensure contact and referral procedures for communication and transport to Hermosillo
  - Arrange CME as needed for staff in collaboration with BAC
  - Work with local citizens in fundraising activities to support unit (patronato)
- Dr. Marcos Serratos activities:
  - Develop transfer protocols
  - Formulate equipment list and price quotes
  - Supervise unit medically
  - Coordinate transports with Project Coordinator to Hermosillo
- ADHS activities:
  - Provide financial support for staff training through CME sponsored by UMC in MX
  - Provide BAB members through Office of Border Health
- Evaluation of project
  - Assess validity and reliability of available data sources
  - Gather baseline data
  - Develop evaluation model
  - Implement evaluation plan and data-gathering activities
- Enhance communication between Nogales, AZ; Nogales, SO; and Hermosillo
  - Dedicated phone line between Hosp Gen de Nogales and Hermosillo
  - Communication protocols between Holy Cross ED, Nogales FD, Cruz Roja, Hospital General de Nogales, Ambulance Vital, and Hospital General del Estado de Sonora
- Enhance transportation between Nogales and Hermosillo
  - Contract with Ambulance Vital
- Provide trauma and emergency services to Ambos Nogales

OUTPUTS

- Funds acquired from funding sources
- Qualitative data – assess staff and community awareness and perception of quality of care and satisfaction
    - Staff interviews and survey instruments
    - Patient interviews and survey instruments
- EMS outputs:
    - # of MX nationals and # of US nationals transported from Nogales Ports of Entry to Holy Cross
    - # of MX nationals and # of US nationals transported from Holy Cross to Nogales Ports of Entry
- AZ hospitals outputs:
    - Monthly / yearly # of MX nationals provided trauma/emergency care in UMC, TMC, Holy Cross, and St. Mary's hospitals
    - Monthly / yearly uncompensated costs of trauma/emergency care for MX nationals in AZ hospitals
- Unit specific outputs:
    - # of advertisements and media spots promoting new unit
    - # staff provided to unit
    - # and types of trainings provided to unit staff
    - # and type of equipment provided to unit
    - # of trauma and emergency cases treated by new unit in Nogales, SO
    - # transported to Hermosillo
    - Monthly / yearly unit-specific trauma- and emergency-related outcomes data:
        - # of mortalities
        - # of morbidities
    - Monthly / yearly unit-specific costs of care for treated cases
        - Equipment
        - Supplies
        - Personnel
        - Training
        - Procedural charges

OUTCOMES

- SHORT-TERM (1-3 yrs)
  - Increase staff and equipment
  - Increase training
  - Decreased transport of MX nationals to AZ hospitals
  - Decreased uncompensated costs of care for MX nationals in AZ hospitals
  - Increase community awareness of services available
  - Increased community support and fundraising
  - Increase quantity of trauma/emergency cases serviced by *Hosp Gen*
  - Increase communication between *Hosp General del Estado de Sonora* in Hermosillo and *Hosp Gen de Nogales*
  - Increase transport of high-level trauma and emergency cases to definitive care in Hermosillo
  - Increase quality of trauma/emergency services
  - Decrease trauma/emergency-related mortality rates at *Hospital General de Nogales*
- LONG-TERM (4-6 yrs)
  - Increase staffing
  - Increase unit size as needed
  - Increase positive community perception of services available
  - Increase community support (*patronato)* to build sustainability into project after initial 3 year funding period
  - Decrease number of trauma/emergency-related mortalities in Nogales, SO
  - Decrease number of trauma/emergency-related morbidities in Nogales, SO

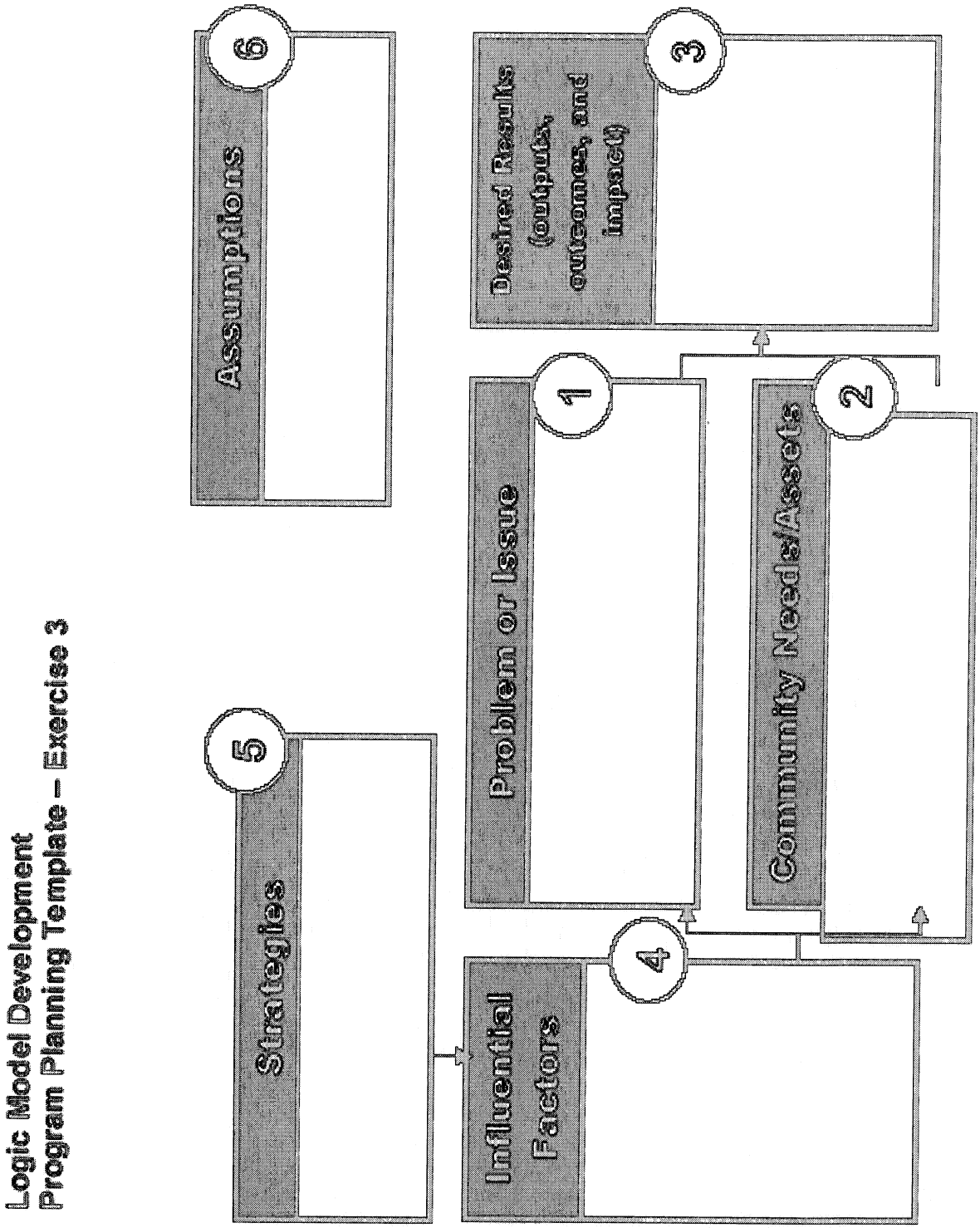
IMPACT (7-10 years)

- Increased access to quality trauma/emergency care for MX border regions for MX and US citizens
- Decrease in uncompensated costs of care for MX nationals to AZ hospitals
- Increased community satisfaction, positive perception, and awareness of MX emergency services
- Decreased reliance of MX nationals on US health care system for emergency services
- Decreased traumatic and emergency medical mortality and morbidity incidence rates in US-MX border region
- Increased health care funding for border health issues from US and MX sources
- Increased expansion of project locally and in other border regions facing similar problems
- Expansion of emergency services infrastructure along the US-MX border
- Increased collaboration between US and MX regarding border health issues
    - Increased collaboration between AZ and Sonora

APPENDIX F:
Arizona-Mexico Commission, Health Subcommittee, Project Presentation Document

(included in Appendix B of main internship report)

APPENDIX G:
Logic Model Reference Templates


Logic Model Development
Program Planning Template – Exercise 3
6
Assumptions
3
Desired Results (outputs, outcomes, and impact)
1
Problem or Issue
2
Community Needs/Assets
5
Strategies
4
Influential Factors

Logic Model Development Program Implementation Template – Exercise 1 & 2

RESOURCES	ACTIVITIES	OUTPUTS	SHORT & LONG-TERM OUTCOMES	IMPACT
In order to accomplish our set of activities we will need the following:	*In order to address our problem or asset we will accomplish the following activities:*	*We expect that once accomplished these activities will produce the following evidence or service delivery:*	*We expect that if accomplished these activities will lead to the following changes in 1-3 then 4-6 years:*	*We expect that if accomplished these activities will lead to the following changes in 7-10 years:*

Logic Model Development Evaluation Planning Template – Exercise 4

Evaluation Focus Area	Audience	Question	Use

Logic Model Development. Indicators Development Template – Exercise 5

Focus Area	Question	Indicators	Technical Assistance Needed

APPENDIX H:
Sample Client Satisfaction Survey

Sample Client Satisfaction Survey

We need your help! By taking just a few minutes and answering these questions, you can help us improve the care that you and your children receive at < Name of Health Care Center >. Please be honest. Your answers will be completely confidential, no one will know how you answered the questions or what you think is good or bad about < Name of Health Care Center >. Thanks for your time and suggestions.

Completed Surveys

Average Age:

Your Sex:

[ ] Female [ ] Male

Do you have medical insurance?

[ ] No [ ] Yes

If yes, do you have (please check one):

[ ] Medicaid [ ] Employer Paid insurance

1. How long have you been coming to < Name of Health Care Center >? (Please check one)

[ ] less than 1 year
[ ] 1 -5 years
[ ] 6 - 10 years
[ ] this is my first visit

2. How did you find out about < Name of Health Care Center >? (Please check one)

[ ] Another agency sent me here
[ ] Someone from my family told to me
[ ] My friend comes to < Name of Health Care Center >
[ ] I received information at a health fair
[ ] primarily school
[ ] Other reasons (please explain)

3. Why do you come to < Name of Health Care Center > (Check all the reasons that apply to you) [ ] I could not get an appointment at another clinic
[ ] I do not know where else to go
[ ] I get free or low cost medical services at < Name of Health Care Center
[ ] The health care providers at < Name of Health Care Center > respect me
[ ] I like having women health care providers
[ ] I trust the health care providers
[ ] I trust the social workers
[ ] My native language is spoken here
[ ] < Name of Health Care Center > is near my house
[ ] Someone from my family comes here
[ ] My friend comes here
[ ] < Name of Health Care Center > staff is available 24 hours a day *OR* I can call < Name of Health Care Center > at any time, day or night
[ ] < Name of Health Care Center > health care providers help me deal with my medical needs
[ ] At < Name of Health Care Center > I get help with social problems when I need it
[ ] I like < Name of Health Care Center > better than other health clinics
[ ] < Name of Health Care Center > reminds me about my appointments
[ ] My children can come with me to my appointment
[ ] Other reasons

4. How often do the following things happen to you at < Name of Health Care Center?

	Always	Usually	Sometimes	Never
The health care providers listen to me				
I understand what the health care providers tell me				

The health care providers answer all my questions				
I am satisfied with the social services workers *OR* I like talking with the social services workers				
I feel comfortable and welcome at <Name of Health Care Center>				
I wait more than 30 minutes for a health care provider to see me				
I think the Center's services costs too much				
When I call the Center, the line is busy				
It is easy for me to get to < Name of Health Care Center >				
When my child is sick I can get an appointment the same day I call				
I can't get an appointment when I am free from work *OR* I can't get an appointment when I have a day off from work				
I have to wait more than 1 week for an appointment				
I am satisfied with the medical care I received at the Center				
I tell my friends to go to < Name of Health Care Center >				

5. Do you have any suggestions to help < Name of Health Care Center > provide better care for you and your children?

_____
_____
_____
_____
_____
_____

Thank you for your time.

APPENDIX I:
Sample Report Employing UMC Financial Codes

FSC 8 OR 766 IP only
1/1/2002-3/31/2002 SOURCE: TSI 04/30/02 MMH
I:\MHORNER\TSI\2002\FSC 8 OR 766 010102-033102.xls
Prepared by QI Dept Contact: D.Brice or M.Horner 4-2988

FSC: 8		Cases	% of Total Cases	Total Days	Average LOS	ACT Total Charge	Average Charge/Case	ACT Total Cost	Average Cost/Case
373	VAGINAL DELIVERY W/O COMP	7	15.91 %	12	1.71	$33,503	$4,786	$14,980	$2,140
391	NORMAL NEWBORN.....0	5	11.36 %	6	1.20	$6,093	$1,219	$2,804	$561
004	SPINAL PROCEDURES.....	2	4.55 %	8	4.00	$121,710	$60,855	$30,992	$15,496
014	SPECIFIC CEREBROVASCULAR	2	4.55 %	2	1.00	$23,599	$11,799	$6,644	$3,322
300	ENDOCRINE DISORDERS W CC.	2	4.55 %	33	16.50	$116,230	$58,115	$33,958	$16,979
372	VAGINAL DELIVERY W COMPLI	2	4.55 %	7	3.50	$23,175	$11,588	$9,809	$4,904
385	NEONATES, DIED OR TRANSF	2	4.55 %	6	3.00	$37,095	$18,547	$10,602	$5,301
389	FULL TERM NEONATE W MAJOR	2	4.55 %	7	3.50	$27,027	$13,514	$8,542	$4,271
003	CRANIOTOMY AGE 0-17...	1	2.27 %	2	2.00	$23,907	$23,907	$7,708	$7,708
089	SIMPLE PNEUMONIA & PLEURI	1	2.27 %	2	2.00	$7,582	$7,582	$2,149	$2,149
098	BRONCHITIS & ASTHMA AGE 0	1	2.27 %	1	1.00	$5,534	$5,534	$1,315	$1,315
113	AMPUTATION FOR CIRC SYSTE	1	2.27 %	6	6.00	$49,374	$49,374	$18,096	$18,096
121	CIRCULATORY DISORDERS W A	1	2.27 %	4	4.00	$12,762	$12,762	$4,117	$4,117
125	CIRCULATORY DISORDERS EXC	1	2.27 %	1	1.00	$10,228	$10,228	$3,745	$3,745
145	OTHER CIRCULATORY SYSTEM	1	2.27 %	2	2.00	$8,803	$8,803	$2,287	$2,287
182	ESOPHAGITIS, GASTROENT &	1	2.27 %	1	1.00	$9,994	$9,994	$2,901	$2,901
189	OTHER DIGESTIVE SYSTEM DI	1	2.27 %	2	2.00	$7,981	$7,981	$1,964	$1,964
211	HIP & FEMUR PROCEDURES EX	1	2.27 %	1	1.00	$32,214	$32,214	$8,710	$8,710
219	LOWER EXTREM & HUMER PROC	1	2.27 %	2	2.00	$4,425	$4,425	$1,303	$1,303
227	SOFT TISSUE PROCEDURES W/	1	2.27 %	1	1.00	$12,022	$12,022	$4,026	$4,026
295	DIABETES AGE 0-35.....0	1	2.27 %	13	13.00	$97,746	$97,746	$31,523	$31,523
298	NUTRITIONAL & MISC METABO	1	2.27 %	1	1.00	$5,233	$5,233	$2,319	$2,319
370	CESAREAN SECTION W CC..0	1	2.27 %	3	3.00	$10,447	$10,447	$3,681	$3,681
390	NEONATE W OTHER SIGNIFICA	1	2.27 %	5	5.00	$4,617	$4,617	$1,763	$1,763
440	W/OUND DEBRIDEMENTS FOR I	1	2.27 %	1	1.00	$11,100	$11,100	$4,572	$4,572
447	ALLERGIC REACTIONS AGE >1	1	2.27 %	1	1.00	$8,534	$8,534	$2,342	$2,342
483	TRACHEOSTOMY EXCEPT FOR F	1	2.27 %	9	9.00	$77,234	$77,234	$21,722	$21,722
484	CRANIOTOMY FOR MULTIPLE S	1	2.27 %	5	5.00	$53,474	$53,474	$16,287	$16,287
FSC Summary:		**44**		**144**	**3.27**	**$841,645**	**$19,128**	**$260,860**	**$5,929**

FSC 8 OR 766 IP Only
1/1/2002-3/31/2002 SOURCE: TSI 04/30/02 MMH
I:\MHORNER\TSI\2002\FSC 8 OR 766 010102-033102.xls
Prepared by QI Dept Contact: D.Brice or M.Horner 4-2988

FSC: 766		Cases	% of Total Cases	Total Days	Average LOS	ACT Total Charge	Average Charge/Case	ACT Total Cost	Average Cost/Case
373	VAGINAL DELIVERY W/O COMP	91	41.55 %	161	1.77	$443,948	$4,879	$214,014	$2,352
372	VAGINAL DELIVERY W COMPLI	27	12.33 %	64	2.37	$166,703	$6,174	$77,521	$2,871
370	CESAREAN SECTION W CC..0	17	7.76 %	92	5.41	$226,529	$13,325	$89,885	$5,287
371	CESAREAN SECTION W/O CC0	9	4.11 %	29	3.22	$92,531	$10,281	$36,040	$4,004
383	OTHER ANTEPARTUM DIAGNOSE	8	3.65 %	20	2.50	$50,201	$6,275	$16,836	$2,104
374	VAGINAL DELIVERY W STERIL	4	1.83 %	37	9.25	$74,676	$18,669	$31,986	$7,997
127	HEART FAILURE & SHOCK..0	3	1.37 %	16	5.33	$41,984	$13,995	$11,927	$3,976
379	THREATENED ABORTION....0	3	1.37 %	10	3.33	$21,511	$7,170	$8,088	$2,696
000		2	0.91 %	2	1.00	$5,234	$2,617	$2,131	$1,066
014	SPECIFIC CEREBROVASCULAR	2	0.91 %	9	4.50	$50,447	$25,223	$12,685	$6,342
091	SIMPLE PNEUMONIA & PLEURI	2	0.91 %	2	1.00	$9,796	$4,898	$2,919	$1,459
132	ATHEROSCLEROSIS W CC...0	2	0.91 %	3	1.50	$7,988	$3,994	$2,174	$1,087
140	ANGINA PECTORIS.....0	2	0.91 %	4	2.00	$10,796	$5,398	$3,193	$1,597
174	G.I. HEMORRHAGE W CC...0	2	0.91 %	3	1.50	$21,082	$10,541	$6,583	$3,292
331	OTHER KIDNEY & URINARY TR	2	0.91 %	3	1.50	$15,537	$7,769	$5,278	$2,639
494	LAPAROSCOPIC CHOLECYSTECT	2	0.91 %	3	1.50	$22,960	$11,480	$8,690	$4,345
089	SIMPLE PNEUMONIA & PLEURI	1	0.46 %	2	2.00	$4,549	$4,549	$1,866	$1,866
095	PNEUMOTHORAX W/O CC....0	1	0.46 %	3	3.00	$9,708	$9,708	$3,434	$3,434
098	BRONCHITIS & ASTHMA AGE 0	1	0.46 %	4	4.00	$10,013	$10,013	$3,580	$3,580
107	CORONARY BYPASS W/O CARDI	1	0.46 %	8	8.00	$39,919	$39,919	$14,105	$14,105
124	CIRCULATORY DISORDERS EXC	1	0.46 %	2	2.00	$11,047	$11,047	$3,076	$3,076
134	HYPERTENSION.....0	1	0.46 %	1	1.00	$6,496	$6,496	$1,333	$1,333
143	CHEST PAIN.....0	1	0.46 %	2	2.00	$10,606	$10,606	$2,722	$2,722
148	MAJOR SMALL & LARGE BOWEL	1	0.46 %	8	8.00	$35,602	$35,602	$10,624	$10,624
167	APPENDECTOMY W/O COMPLICA	1	0.46 %	1	1.00	$10,020	$10,020	$3,931	$3,931
172	DIGESTIVE MALIGNANCY W CC	1	0.46 %	7	7.00	$20,574	$20,574	$5,824	$5,824
175	G.I. HEMORRHAGE W/O CC.0	1	0.46 %	1	1.00	$2,564	$2,564	$678	$678
185	DENTAL & ORAL DIS EXCEPT	1	0.46 %	1	1.00	$6,417	$6,417	$2,358	$2,358
205	DISORDERS OF LIVER EXCEPT	1	0.46 %	1	1.00	$9,899	$9,899	$2,109	$2,109
218	LOWER EXTREM & HUMER PROC	1	0.46 %	2	2.00	$22,900	$22,900	$7,525	$7,525
219	LOWER EXTREM & HUMER PROC	1	0.46 %	2	2.00	$15,987	$15,987	$5,483	$5,483
226	SOFT TISSUE PROCEDURES W	1	0.46 %	11	11.00	$37,367	$37,367	$12,316	$12,316
233	OTHER MUSCULOSKELET SYS &	1	0.46 %	5	5.00	$18,775	$18,775	$4,648	$4,648
277	CELLULITIS AGE >17 W CC0	1	0.46 %	2	2.00	$6,517	$6,517	$1,895	$1,895
294	DIABETES AGE >35.....0	1	0.46 %	1	1.00	$3,971	$3,971	$1,078	$1,078
295	DIABETES AGE 0-35.....0	1	0.46 %	2	2.00	$9,688	$9,688	$2,858	$2,858
296	NUTRITIONAL & MISC METABO	1	0.46 %	2	2.00	$5,997	$5,997	$1,709	$1,709
316	RENAL FAILURE.....0	1	0.46 %	2	2.00	$5,226	$5,226	$1,343	$1,343
320	KIDNEY & URINARY TRACT IN	1	0.46 %	2	2.00	$6,700	$6,700	$1,948	$1,948
326	KIDNEY & URINARY TRACT SI	1	0.46 %	1	1.00	$3,507	$3,507	$1,090	$1,090
338	TESTES PROCEDURES, FOR MA	1	0.46 %	7	7.00	$69,156	$69,156	$22,402	$22,402
357	UTERINE & ADNEXA PROC FOR	1	0.46 %	16	16.00	$42,528	$42,528	$14,032	$14,032
359	UTERINE & ADNEXA PROC FOR	1	0.46 %	1	1.00	$11,666	$11,666	$4,580	$4,580
365	OTHER FEMALE REPRODUCTIVE	1	0.46 %	8	8.00	$28,621	$28,621	$9,571	$9,571
376	POSTPARTUM & POST ABORTIO	1	0.46 %	1	1.00	$1,625	$1,625	$875	$875

FSC 8 OR 766 IP Only
1/1/2002-3/31/2002 SOURCE: TSI 04/30/02 MMH
I:\MHORNER\TSI\2002\FSC 8 OR 766 010102-033102.xls
Prepared by QI Dept Contact: D.Brice or M.Horner 4-2988

377	POSTPARTUM & POST ABORTIO	1	0.46 %	2	2.00	$14,268	$14,268	$5,348	$5,348
380	ABORTION W/O D&C.....0	1	0.46 %	1	1.00	$4,519	$4,519	$1,917	$1,917
430	PSYCHOSES.....0	1	0.46 %	3	3.00	$4,212	$4,212	$2,247	$2,247
449	POISONING & TOXIC EFFECTS	1	0.46 %	3	3.00	$24,684	$24,684	$5,591	$5,591
455	OTHER INJURY, POISONING &	1	0.46 %	1	1.00	$2,258	$2,258	$678	$678
468	EXTENSIVE O.R. PROCEDURE	1	0.46 %	37	37.00	$331,729	$331,729	$125,379	$125,379
475	RESPIRATORY SYSTEM DIAGNO	1	0.46 %	5	5.00	$37,803	$37,803	$8,921	$8,921
477	NON-EXTENSIVE O.R. PROCED	1	0.46 %	10	10.00	$23,792	$23,792	$9,044	$9,044
483	TRACHEOSTOMY EXCEPT FOR F	1	0.46 %	71	71.00	$743,978	$743,978	$248,204	$248,204
487	OTHER MULTIPLE SIGNIFICAN	1	0.46 %	9	9.00	$38,015	$38,015	$11,164	$11,164
489	HIV W MAJOR RELATED CONDI	1	0.46 %	6	6.00	$18,421	$18,421	$5,356	$5,356
514	CARDIAC DEFIBRILLATOR IMP	1	0.46 %	11	11.00	$147,117	$147,117	$60,650	$60,650
FSC Summary:		**219**		**723**	**3.30**	**$3,120,361**	**$14,248**	**$1,163,444**	**$5,313**

APPENDIX J:
Interfacility Transfer Protocols

Underlying Principle of Transfer

Transfer the patient whenver the patient's injury or physiology outstrips the capabilities of the receiving facility. Capabilities include surgeon availability and skill, ICU availability, the number of patients arriving at one time, or availability of special radiographic procedures.

By System

CNS: Glasgow coma scale less than 14 or focal neurological deficit

Chest: Wide mediastinum, cardiac injury, flail chest, massive pulmonary contusion

Abdomen: After a damage control laparotomy

Pelvis: Open pelvic fracture or unstable pelvis

Extremity: Fracture or dislocation with the loss of the distal pulse, open long bone fracture

Multisystem Injury: Injuries in 2 or more major systems

**If the patient is physiologically unstable, the patient may need operative control of the hemorrhage prior to transfer. This would usually be in the form of a damage control laparotomy

APPENDIX K:
Baseline Data

A. *NeoVida – Agua Prieta* Project Summary Data

B. Arizona Hospital and Healthcare Association: Undocumented Alien Survey (Feb 1, 2001 – April 30, 2001)

C. Nogales Fire Department Cross-Border Transport Data (Jan 2001 – Feb 2002)

D. Pan-American Health Organization: "Mortality Profiles of the Sister Communities on the United States-Mexico Border" Summary Reports

NEOVIDA-AGUA Prieta data

Total cases since 1997 inception: 644

125 C-sections

165 patients in unit

16 ground transport to Hermosillo

13 air transport to Hermosillo

97-98 billed charges by UMC/TMC for perinatal care to MX national: $2.2 million

avg cost/pt @ unit: $50,000

estimated cost savings to UMC/TMC (29 cases transported x $50,000/case): $1,450,000

AZ HOSPITAL AND HEALTHCARE ASSOCIATION
UNDOCUMENTED ALIEN SURVEY
(FEB 01 – APR 30, 2001)

Hospital Charges Related to Treating Undocumented Immigrants
A Survey of 16 Arizona Hospitals Covering the Period of February 1 Through April 30, 2001

	Three Month Reported Data:				Annualized Results:			
	Inpatient	Outpatient	Unknown	Total	Inpatient	Outpatient	Unknown	Total
Charges	$ 9,672,739	$ 898,116	2,399,785	$ 12,970,640	$ 38,690,956	$ 3,592,464	9,599,140	$ 51,882,560
Uncompensated Charges								44,100,176
Mode of Arrival:								
Ambulance	90	161		251	360	644		1,004
Helicopter	31	1		32	124	4		128
Walk-In	200	556		756	800	2,224		3,024
DPS	4	5		9	16	20		36
Border Patrol	3	-		3	12	-		12
Fire Department	7	5		12	28	20		48
Other	6	7		13	24	28		52
Unknown	125	284	306	715	500	1,136	1,224	2,860
Total	466	1,019	306	1,791	1,864	4,076	1,224	7,164

Notes:

Reporting hospitals include Banner Health System, Benson Hospital, Chandler Regional Hospital, Copper Queen Community Hospital, Carondelet hospitals, John C. Lincoln Hospital - North Mountain, Maricopa Integrated Health System, Maryvale Hospital Medical Center, Phoenix, Children's Hospital, St. Joseph's Hospital and Medical Center, Tucson Medical Center, & University Medical Center. In all 16 hospitals reported.

On average the reporting hospitals were reimbursed 15% of the total charges with the majority of this reimbursement coming from the AHCCCS, SES program.

Foreign National Data -- Survey
February 1 - April 30, 2001
Prepared by Jim Haynes

	Three Month Reported Data:				Annualized Results:			
	Inpatient	Outpatient	Unknown	Total	Inpatient	Outpatient	Unknown	Total
Charges	$ 9,672,739	$ 898,116	2,399,785	$ 12,970,640	$ 38,690,956	$ 3,592,464	9,599,140	$ 51,882,560
Uncompensated Charges								**44,100,176**
Mode of Arrival:								
Ambulance	90	161		251	360	644		1,004
Helicopter	31	1		32	124	4		128
Walk-In	200	556		756	800	2,224		3,024
DPS	4	5		9	16	20		36
Border Patrol	3	-		3	12	-		12
Fire Department	7	5		12	28	20		48
Other	6	7		13	24	28		52
Unknown	125	284	306	715	500	1,136	1,224	2,860
Total	466	1,019	306	1,791	1,864	4,076	1,224	7,164

Notes:
Reporting hospitals include Banner Health System, Benson Hospital, Chandler Regional Hospital, Copper Queen Community Hospital, Carondelet hospitals, John C. Lincoln Hospital - North Mountain, Maricopa Integrated Health System, Maryvale Hospital Medical Center, Phoenix, Children's Hospital, St. Joseph's Hospital and Medical Center, Tucson Medical Center, & University Medical Center.
The information includes UDA's that were eligible for AHCCCS emergency services program (residents).
In all 16 hospitals reported.

On average the reporting hospitals were reimbursed 15% of the total charges with the majority of this reimbursement coming from AHCCCS.

Other comments include the following pertaining to the reported data.
...we are trying to improve the collection of data to ensure we are capturing the majority of the instances. I believe our numbers will increase.
...our utilization department feels that we are only utilizing our "foreign national " plan code 25% -50% of the time. We are working on educating the registration staff to be able to better identify the impact.
...striving to improve the data collection.
...I really believe that this underestimates the real picture, but this is the best documentation we have right now.
...this was an unusual three month period that was much lower than normal for the last several years.

Banner ESP
February 1 - April 30, 2001

Charges	2,399,785
Patients	306
Payments	779,377

UDA Survey
February 1 - April 30, 2001
Hospital Banner Health System

	Inpatient	Outpatient	Total
Charges	681,027	117,742	798,769
Payments:			
AHCCCS			-
Insurance			-
Private Pay	50	952	1,002
Other			-
Total	50	952	1,002
Collection Percentage:	0.00	0.01	0.00
Mode of Arrival:			
Ambulance	1	3	4
Helicopter	2		2
Walk-In	15	68	83
DPS			-
Border Patrol			-
Fire Department	7	5	12
Other	1	1	2
Unknown	2	2	4
Total	28	79	107

UDA Survey
February 1 - April 30, 2001
Hospital Benson Hospital

	Inpatient	Outpatient	Total
Charges	7,304	-	7,304
Payments:			
AHCCCS			-
Insurance			-
Private Pay	-	-	-
Other			-
Total	-	-	-
Collection Percentage:	-	#DIV/0!	-
Mode of Arrival:			
Ambulance	8	-	8
Helicopter	-		-
Walk-In	-	-	-
DPS	-	-	-
Border Patrol	-	-	-
Fire Department	-	-	-
Other	-	-	-
Unknown	-	-	-
Total	8	-	8

UDA Survey
February 1 - April 30, 2001
Hospital Carondelet Health Network

	Inpatient	Outpatient	Total
Charges	350,984	100,629	451,613
Payments:			
AHCCCS			-
Insurance			-
Private Pay	26,620	11,228	37,848
Other			-
Total	26,620	11,228	37,848
Collection Percentage:	0.08	0.11	0.08
Mode of Arrival:			
Ambulance	6	72	78
Helicopter	-		-
Walk-In	10	33	43
DPS			-
Border Patrol			-
Fire Department	-	-	-
Other	-	-	-
Unknown	10	30	40
Total	26	135	161

The above data includes St. Mary's, St. Joseph's, and Holy Cross.

UDA Survey
February 1 - April 30, 2001
Hospital **Chandler Regional Hospital**

	Inpatient	Outpatient	Total
Charges	1,079,932	243,352	1,323,284
Payments:			
AHCCCS	181,174	9,822	190,996
Insurance			-
Private Pay	6,950	7,120	14,070
Other	-	-	-
Total	188,124	16,942	205,066
Collection Percentage:	0.17	0.07	0.15
Mode of Arrival:			
Ambulance	-	-	-
Helicopter	-	-	-
Walk-In	-	-	-
DPS	-	-	-
Border Patrol	-		-
Fire Department	-	-	-
Other	-	-	-
Unknown	85	208	293
Total	85	208	293

UDA Survey
February 1 - April 30, 2001
Hospital **Copper Queen Hospital**

	Inpatient	Outpatient	Total
Charges	-	23,935	23,935
Payments:			
AHCCCS	-	-	-
Insurance		344	344
Private Pay	-	-	-
Other	-	-	-
Total	-	344	344
Collection Percentage:	-	0.01	0.01
Mode of Arrival:			
Ambulance	-	16	16
Helicopter	-	-	-
Walk-In	-	-	-
DPS	-	-	-
Border Patrol	-		-
Fire Department	-	-	-
Other	-	-	-
Unknown	-	-	-
Total	-	16	16

UDA Survey
February 1 - April 30, 2001
Hospital John C. Lincoln North Mountain

	Inpatient	Outpatient	Total
Charges	1,138,866	16,925	1,155,791
Payments:			
AHCCCS	177,672	335	178,007
Insurance			-
Private Pay	-	-	-
Other			-
Total	177,672	335	178,007
Collection Percentage:	0.16	0.02	0.15
Mode of Arrival:			
Ambulance	21	1	22
Helicopter	1		1
Walk-In	20	11	31
DPS			-
Border Patrol			-
Fire Department	-	-	-
Other	-	-	-
Unknown	-	-	-
Total	42	12	54

UDA Survey
February 1 - April 30, 2001
Hospital Maricopa Community Hospital

	Inpatient	Outpatient	Total
Charges	650,178	1,102	651,280
Payments:			
AHCCCS	-	-	-
Insurance			-
Private Pay	-	-	-
Other	6,392	44	6,436
Total	6,392	44	6,436
Collection Percentage:	0.01	0.04	0.01

Mode of Arrival:			
Ambulance			-
Helicopter			-
Walk-In			-
DPS			-
Border Patrol			-
Fire Department			-
Other			-
Unknown	26	4	30
Total	26	4	30

UDA Survey
February 1 - April 30, 2001
Hospital **Maryvale Hospital**

	Inpatient	Outpatient	Total
Charges	202,809	35,112	237,921
Payments:			
AHCCCS	16,743	2,085	18,828
Insurance	-		-
Private Pay	25,400	7,700	33,100
Other	-	-	-
Total	42,143	9,785	51,928
Collection Percentage:	0.21	0.28	0.22
Mode of Arrival:			
Ambulance	4	14	18
Helicopter	-	-	-
Walk-In	7	52	59
DPS		-	-
Border Patrol	-	-	-
Fire Department		-	-
Other	-	-	-
Unknown	-	-	-
Total	11	66	77

UDA Survey
February 1 - April 30, 2001
Hospital Phoenix Children's Hospital

	Inpatient	Outpatient	Total
Charges	237,203	11,213	248,416
Payments:			
AHCCCS			
Insurance			
Private Pay		200	
Other			
Total	-	200	-
Collection Percentage:	-	0	-
Mode of Arrival:			
Ambulance	2	1	3
Helicopter			-
Walk-In		12	12
DPS			-
Border Patrol			-
Fire Department			-
Other	1		1
Unknown			-
Total	3	13	16

UDA Survey
February 1 - April 30, 2001
Hospital **St. Joseph's Hospital - CHW**

	Inpatient	Outpatient	Total	
Charges	3,788,667	219,381	4,008,048	
Payments:				
AHCCCS	-	-	-	Unavailable at the the present time
Insurance			-	
Private Pay	-	-	-	
Other	-	-	-	
Total	-	-	-	
Collection Percentage:	-	-	-	
Mode of Arrival:				
Ambulance	21	44	65	
Helicopter	16	1	17	
Walk-In	125	300	425	
DPS	-	-	-	
Border Patrol			-	
Fire Department			-	
Other	-	-	-	
Unknown	-	-	-	
Total	162	345	507	

e

UDA Survey
February 1 - April 30, 2001
Hospital **Tucson Medical Center**

	Inpatient	Outpatient	Total
Charges	734,114	42,684	776,798
Payments:			
AHCCCS	-	-	-
Insurance	30,532		30,532
Private Pay	47,747	8,483	56,230
Other	-	-	-
Total	78,279	8,483	86,762
Collection Percentage:	0.11	0.20	0.11
Mode of Arrival:			
Ambulance	4	-	4
Helicopter	8	-	8
Walk-In	15	-	15
DPS		-	-
Border Patrol	3	-	3
Fire Department		-	-
Other	-	-	-
Unknown	2	40	42
Total	32	40	72

UDA Survey
February 1 - April 30, 2001
Hospital **University Medical Center**

	Inpatient	Outpatient	Total
Charges	801,655	86,041	887,696
Payments:			
AHCCCS	-	-	-
Insurance			-
Private Pay	7,148	17,462	24,610
Other	-	-	-
Total	7,148	17,462	24,610
Collection Percentage:	0.01	0.20	0.03
Mode of Arrival:			
Ambulance	31	10	41
Helicopter	4		4
Walk-In	8	80	88
DPS	4	5	9
Border Patrol			-
Fire Department			-
Other	4	6	10
Unknown	-	-	-
Total	51	101	152

HOLY CROSS HOSPITAL
ESTIMATING IMPACT IN
PROVIDING CARE TO FOREIGN NATIONALS
FOR CALENDAR YEAR 2001

	JAN-01 to MAR-01	APR-01 to JUN-01	JUL-01 to SEP-01	OCT-01 to DEC-01	TOTAL 2001	JAN-02 to FEB-02
BAD DEBT TOTAL	$ 245,132.00	$ 439,737.00	$ 346,278.00	$ 219,384.00	$ 1,250,531.00	$ 143,390.00
ESTIMATE 30% DUE TO FOREIGN NATIONALS	$ 73,540.00	$ 131,921.00	$ 103,883.00	$ 65,815.00	$ 375,159.00	$ 43,017.00
CHARITY TOTAL* (Believed to be largely Foreign Nationals)	$ 72,536.00	$ 78,877.00	$ 119,636.00	$ 33,128.00	$ 304,177.00	$ 20,752.80
SUB-TOTAL (Estimated Foreign National Unreimbursed Care)	$ 146,076.00	$ 210,798.00	$ 223,519.00	$ 98,943.00	$ 679,336.00	
*CHARITY FOR UNDOCUMENTED PATIENTS WITH CLEAR ADDRESSES (Included in Charity Total)	$ 27,463.55	$ 46,693.20	$ 47,029.92	$ 28,793.00	$ 149,952.67	$ 20,752.80
INPATIENT		$ 15,524.70	$ 26,012.00	$ 3,459.55	$ 44,996.25	
# OF PATIENTS		2	3	1	6	
ER PATIENTS	$ 27,463.55	$ 31,168.50	$ 21,017.92	$ 25,333.45	$ 104,983.42	$ 20,752.80
# of PATIENTS	8	29	21	24		19

NOTE: There is substantial difficulty in getting correct addresses, therefore, we can only estimate, based on experience, the percentage of our bad debt attributed to Foreign Nationals. You will note that 50% of our Charity care is clearly attributed, by address, to people from Mexico – this occurs because they often come in during an emergency from the Border Crossing or injury on the wall.

NOGALES FIRE DEPARTMENT
DATA

Nogales Fire Department Cross-border transports between GPOE/WPOE and HCH ER (Jan 01 - Feb 02)

	# runs	# US citizens	# MX citizens	#unknown citizenship	# MX to GPOE	#MX to HCH ER	# Emergency	# Trauma
2001								
Jan	20	15	5	0	4	1	9	8
Feb	17	6	11	0	4	7	8	6
Mar	13	4	8	0	6	2	3	5
Apr	24	11	11	2	7	4	5	8
May	27	16	9	2	3	6	5	16
June	14	8	5	1	2	3	7	4
July	17	8	5	4	3	2	6	4
Aug	26	14	12	0	4	8	10	10
Sept	12	10	2	0	0	2	5	6
Oct	14	8	6	0	0	6	8	4
Nov	15	10	5	0	0	5	12	2
Dec	16	12	4	0	1	3	2	12
Total 2001	**215**	**122**	**83**	**9**	**34**	**49**	**80**	**85**
2002								
Jan	16	12	4	0	0	4	7	9
Feb	20	8	12	0	3	9	4	12
Grand Total:	**251**	**142**	**99**	**9**	**37**	**62**	**91**	**106**

Total runs of any kind for entire year 2001 = 2093

border runs account for 251/2093 = 11.992% or 12% of total runs
MX citizen runs account for 99/2093 = 4.730% or 5% of total runs

GPOE = Grand Port of Entry, Nogales, AZ
WPOE = West Port of Entry, Nogales, AZ
HCH ER = Holy Cross Hospital, Nogales, AZ

Nogales Fire Deparment charges for cross-border transport (Jan 01 - Feb 02)

	# runs	Total charges ($)	Reimbursement*	Difference	Type of payments	
					Self-pay	Insurance
2001						
Jan	20	$3,327.50	n/a		13	7
Feb	17	$3,068	n/a		12	5
Mar	13	$3,068	n/a		10	3
Apr	24	$3,830	n/a		18	6
May	27	$3,725.50	n/a		19	8
Jun	14	$2,441	n/a		11	3
Jul	17	$2,435	n/a		12	5
Aug	26	$8,207**	n/a		18	8
Sep	12	$5,220	n/a		8	4
Oct	14	$5,701	n/a		11	3
Nov	15	$6,543	n/a		12	3
Dec	16	$7,004	n/a		11	5
Total 2001:	**215**	**46,363**			**155**	**60**
2002						
Jan	16	$6,530			10	6
Feb	20	$8,722			16	4
Grand Totals:	**251**	**$61,615**			**181**	**70**

* *Reimbursement data not supplied by Nogales Fire Department at time of report*
***Base rate increase from $175 to $425*

Total charges for 2001: $46,363
Total reimbursement for 2001: *not available at this time*
Total difference for 2001: *not available at this time*

Nogales Fire Department Cross-border transport types between GPOE and HCH ER from Jan 01 - Feb 02

	Total # runs in month*	# border runs	# Emergency runs	# Trauma runs	# other
2001					
Jan	n/a	20	9	8	3
Feb	n/a	17	8	6	3
Mar	n/a	13	3	5	5
Apr	n/a	24	5	8	11
May	n/a	27	5	16	6
June	n/a	14	7	4	3
July	n/a	17	6	4	7
Aug	n/a	26	10	10	6
Sept	n/a	12	5	6	1
Oct	n/a	14	8	4	2
Nov	n/a	15	12	2	1
Dec	n/a	16	2	12	2
Total 2001:		**215**	**80**	**85**	**50**
2002					
Jan	n/a	16	7	9	0
Feb	n/a	20	4	12	4
Grand Total:		**251**	**91**	**106**	**54**

Total runs of any kind for entire year 2001 = 2093

*Total run data not supplied by Nogales Fire Department at time of report

Nogales Fire Department Cross-border transports for Jan 2001

Run #	Nationality	Pick-up site	Destination	Chief Complaint	Category*	Charge ($)	Reimbursed ($)**	Difference ($)	Payment Type
1	US	GPOE	HCH ER	unknown	unknown	178	n/a		IHS
5	US	GPOE	HCH ER	cocaine, EtOH	E	181	n/a		sp
7	US	GPOE	HCH ER	chest pain	E	93.5	n/a		insurance
21	US	GPOE	HCH ER	HTN	no	178	n/a		sp
23	US	GPOE	HCH ER	pneumonia, infant	E	181	n/a		insurance
25	US	GPOE	HCH ER	LOC, EtOH	E	178	n/a		insurance
31	US	GPOE	HCH ER	assault in MX x 2	T-assault	93.5	n/a		sp
44	US	GPOE	HCH ER	back pain	T-MVA	93.5	n/a		insurance
71	US	WPOE	HCH ER	EtOH, Valium OD	E	181	n/a		sp
77	US	GPOE	HCH ER	head injury during fight	T-assault	178	n/a		sp
80	US	GPOE	HCH ER	head injury, no assault	E	178	n/a		sp
81	US	GPOE	HCH ER	seizures, infant	E	178	n/a		sp
95	US	GPOE	HCH ER	chest pain	E	178	n/a		insurance
101	MX	HCH ER	GPOE	fx - leg	T-fx/sp	181	n/a		sp
105	US	GPOE	HCH ER	burn injury	T-burn	178	n/a		sp
127	MX	HCH ER	GPOE	jumper, ankle injury	T-fx/sp	184	n/a		sp
161	MX	HCH ER	GPOE	fx - ankle	T-fx/sp	181	n/a		sp
178	MX	HCH ER	GPOE	transport: weakness, fatigue	no	178	n/a		insurance
179	MX	GPOE	HCH ER	GSW to ankle	T-GSW	178	n/a		sp
180	US	GPOE	HCH ER	heroine OD	E	178	n/a		sp
Total: 20					**E = 9**	**$3,327.50**			
					T = 8				*sp=self-pay*

US - 15
MX to GPOE - 4
MX to HCH ER - 1

MX = Mexico citizens
US = United States citizens

MVA = 1
fx/sp = 3
GSW = 1
burn = 1
assault = 2

**E=emergency*
T=Trauma
MVA = motor vehicle accident
fx/sp = fracture/sprain/musculoskeletal injury
GSW=gunshot wound

**Reimbursement data not supplied by Nogales Fire Department at time of report

Nogales Fire Department Cross-border transports for Feb 2001

Run #	Nationality	Pick-up site	Destination	Chief Complaint	Category	Charge ($)	Reimbursed ($)	Difference ($)	Payment Type
192	MX	GPOE	HCH ER	chest pain, tx'd in MX	E	181			insurance
202	MX	GPOE	HCH ER	vag bleeding, labor	E	181			self-pay
203	MX	HCH ER	GPOE	post-delivery transport	no	178			self-pay
206	US	GPOE	HCH ER	MVA, leg gangrene	T-MVA	178			self-pay
241	MX	HCH ER	GPOE	jumper, ankle fx	T-fx/sp	178			self-pay
242	US	GPOE	HCH ER	stab wound	T-assault	181			self-pay
243	MX	HCH ER	GPOE	clavicular fx	T-fx/sp	181			self-pay
244	US	GPOE	HCH ER	unresponsive, tx'd in MX	E	181			insurance
255	MX	GPOE	HCH ER	chest pain	E	181			insurance
257	MX	GPOE	HCH ER	labor pains	E	181			self-pay
260	MX	GPOE	HCH ER	infant - fever, convulsions	E	181			self-pay
264	MX	HCH ER	GPOE	post-ankle fx	no	181			self-pay
268	US	GPOE	HCH ER	stroke	E	181			insurance
283	MX	GPOE	HCH ER	AMI, tx'd in MX	E	181			self-pay
293	US	GPOE	HCH ER	knee injury	T-fx/sp	181			insurance
332	US	GPOE	HCH ER	MVA	T-MVA	181			self-pay
338	MX	HCH ER	GPOE	post-ankle fx	no	181			self-pay

Total:

17

US=6

MX to GPOE=4

MX to HCH ER=7

E=8

T=6

MVA=2

fx/sp=3

assault=1

$3,068

Nogales Fire Department Cross-border transports for March 2001

Run #	Nationality	Pick-up site	Destination	Chief Complaint	Category	Charge ($)	Reimbursed ($)	Difference ($)	Payment Type
364	US	WPOE	HCH ER	chest pain	E	181			self-pay
383	MX	HCH ER	GPOE	post-ankle injury	no	181			self-pay
399	MX	HCH ER	GPOE	compression/pelvis fx	T-fx/sp	181			self-pay
419	US	GPOE	HCH ER	hip fx, dx'd in MXq	T-fx/sp	228			insurance
422	US	GPOE	HCH ER	MVA - clavicle fx	T-fx/sp	228			insurance
426	MX	HCH ER	GPOE	post-ankle injury	no	228			self-pay
447	MX	HCH ER	GPOE	post-ankle injury	no	181			self-pay
476	US	GPOE	HCH ER	miscarriage, vag bleed	E	181			insurance
482	MX	int'l fence	HCH ER	ankle fx	T-fx/sp	181			self-pay
483	MX	HCH ER	GPOE	post-ankle injury	no	181			self-pay
493	unknown								
502	MX	GPOE	HCH ER	pneumonia/seizures	E	178			self-pay
512	MX	HCH ER	GPOE	knee injury	T-fx/sp	178			self-pay

Total:

13

US - 4
MX to GPOE - 6
MX to HCH ER - 2

E=3
T=5
fx/sp=5

$3,068

Nogales Fire Department cross-border transports for Apr 2001

Run #	Nationality	Pick-up site	Destination	Chief Complaint	Category	Charge ($)	Reimbursed ($)	Difference ($)	Payment Type
520	US	GPOE	HCH ER	MVA, pelvis injury	T-MVA	93.5			self-pay
520	US	GPOE	HCH ER	MVA	T-MVA	93.5			self-pay
523	US	GPOE	HCH ER	MVA	T-MVA	178			insurance
525	MX	GPOE	HCH ER	pedestrian vs. car	T-MVA	178			self-pay
532	MX	WPOE	HCH ER	shoulder pain	no	181			self-pay
533	MX	WPOE	HCH ER	jumper, tib/fib	T-fx/sp	181			self-pay
534	MX	HCH ER	GPOE	post-injury transpor	no	181			self-pay
549	US	GPOE	HCH ER	arm fx	T-fx/sp	178			insurance
554	US	GPOE	HCH ER	labor	E	178			insurance
559	US	GPOE	HCH ER	assault, abd injury	T-assault	178			insurance
561	US	GPOE	HCH ER	CP/dyspnea	E	178			insurance
565	US	GPOE	HCH ER	stroke	E	181			self-pay
570	unknown	GPOE	HCH ER	unknown					
580	US	GPOE	HCH ER	stroke	E	181			insurance
583	US	WPOE	HCH ER	fall injury	T-fx/sp	228			self-pay
591	US	GPOE	HCH ER	child, convulsions	E	178			self-pay
592	MX	GPOE	HCH ER	need CT scan	no	181			self-pay
593	MX	HCH ER	GPOE	return from CT	no	178			self-pay
618	MX	HCH ER	GPOE	post-injury transpor	no	181			self-pay
624	MX	HCH ER	GPOE	post-injury transpor	no	181			self-pay
641	MX	HCH ER	GPOE	post-injury transpor	no	90.5			self-pay
641	MX	HCH ER	GPOE	dehydration	no	90.5			self-pay
651	unknown	GPOE	HCH ER	DM/HTN	no	181			self-pay
665	MX	HCH ER	GPOE	dehydration	no	181			self-pay

Total:

24

US=11
MX to GPOE=7
MX to HCH ER=4
unknown=2

E=5
T=8
MVA=4
fx/sp=3
assault=1

$3,830

Nogales Fire Department cross-border transports for Aug 2001

Run #	Nationality	Pick-up site	Destination	Chief Complaint	Category	Charge ($)	Reimbursed ($)	Difference ($)	Payment Type
1214	MX	GPOE	HCH ER	internal bleeding	E	231			self-pay
1219	US	GPOE	HCH ER	facial injury, LOC	T-other	231			insurance
1220	MX	GPOE	HCH ER	stroke	E	231			self-pay
1227	US	GPOE	HCH ER	abd pain, n/v	E	228			insurance
1231	US	WPOE	HCH ER	hip fx	T-fx/sp	178			insurance
1239	MX	HCH ER	GPOE	post-injury transport, jumper	no	181			self-pay
1246	MX	HCH ER	GPOE	seizures	no	181			self-pay
1247	US	GPOE	HCH ER	poss appendicitis, tx'd in MX	E	181			self-pay
1270	MX	GPOE	HCH ER	assault-head injury	T-assault	178			self-pay
1271	MX	GPOE	HCH ER	resp distress	E	181			self-pay
1277	US	GPOE	HCH ER	MVA in Mx	T-MVA	181			self-pay
1278	MX	GPOE	HCH ER	flank pain, LOC	no	181			self-pay
1280	MX	HCH ER	GPOE	post-injury transport, jumper	no	181			self-pay
1310	US	GPOE	HCH ER	assault - head lac	T-assault	437			self-pay
1328	MX	GPOE	HCH ER	convulsions	E	437			self-pay
1310	US	GPOE	HCH ER	assault - arm lac	T-assault	437			insurance
1310	US	GPOE	HCH ER	assault - head lac	T-assault	437			self-pay
1310	US	GPOE	HCH ER	assault - head lac	T-assault	437			self-pay
1329	MX	HCH ER	GPOE	stroke, transport to general	no	437			self-pay
1334	US	customs holding cell	HCH ER	suicide attempt	E	431			insurance
1338	US	GPOE	HCH ER	MVA-shoulder/leg fx	T-MVA, T-fx/sp	431			insurance
1348	US	GPOE	HCH ER	n/v, jaw pain	E	437			insurance
1349	MX	GPOE	HCH ER	MVA	T-MVA	437			self-pay
1350	MX	GPOE	HCH ER	pneumonia, HIV, tx'd in Hermosillo	E	437			self-pay
1360	US	GPOE	HCH ER	hip pain	no	437			insurance
1368	US	GPOE	HCH ER	internal bleeding	E	431			self-pay

Total:

26

E=10
T=10
assault=5
MVA=3
fx/sp=2
other=1

$8,207

US=14
MX to GPOE=4
MX to HCH ER=8

increased base rate in Aug to establish comparable base rates with rest of state as well as neighboring areas of Tubac, Rio Rico to offset possible Medicare fraud and competition factors within the county

Nogales Fire Department cross-border transports for Sep 2001

Run #	Nationality	Pick-up site	Destination	Chief Complaint	Category	Charge ($)	Reimbursed ($)	Difference ($)	Payment Type
1395	US	WPOE	HCH ER	CP	E	431			self-pay
1438	US	GPOE	HCH ER	MVA, paralysis, tx'd in MX	T-MVA	437			self-pay
1450	MX	GPOE	HCH ER	MVA	T-MVA	437			self-pay
1453	US	GPOE	HCH ER	assault-head lac	T-assault	431			self-pay
1463	US	GPOE	HCH ER	MVA-pelvis injury	T-MVA	437			insurance
1466	MX	GPOE	HCH ER	ankle fx, jumper	T-fx/sp	437			self-pay
1471	US	GPOE	HCH ER	abortion @ basico, vag bleeding, requested better care	E	437			insurance
1476	US	WPOE	HCH ER	CP	E	431			insurance
1500	US	WPOE	HCH ER	hip fx	T-fx/sp	431			insurance
1524	US	GPOE	HCH ER	OD	E	437			self-pay
1525	US	GPOE	HCH ER	EtOH intox	no	437			self-pay
1535	US	GPOE	HCH ER	CP, tx'd in MX	E	437			self-pay

Total:
12

US=10
MX=2
to GPOE=0
to HCH ER=2

E=5
T=6
MVA=3
assault=1
fx/sp=2

$5,220

Nogales Fire Department cross-border transports for Oct 2001

Run #	Nationality	Pick-up site	Destination	Chief Complaint	Category	Charge ($)	Reimbursed ($)	Difference ($)	Payment Type
1552	US	GPOE	HCH ER	seizures	no	437			IHS
1559	MX	GPOE	HCH ER	AMI, tx'd in MX	E	437			self-pay
1579	US	GPOE	HCH ER	AMI	E	437			self-pay
1582	MX	WPOE	HCH ER	abd pain	E	437			self-pay
1599	US	GPOE	HCH ER	MVA, no tx in MX	T-MVA	234.5			self-pay
1599	US	GPOE	critical air	MVA, no tx in MX	T-MVA	234.5			self-pay
1609	US	GPOE	HCH ER	femur fx	T-fx/sp	437			self-pay
1628	US	GPOE	HCH ER	facial lac	T-other	437			insurance
1640	MX	GPOE	HCH ER	leg pain	no	437			self-pay
1656	US	GPOE	HCH ER	labor pains	E	437			insurance
1674	MX	GPOE	HCH ER	infant, pneumothorax, tx'd in MX	E	431			self-pay
1678	MX	GPOE	HCH ER	CP	E	437			self-pay
1691	US	GPOE	HCH ER	resp distress	E	431			self-pay
1695	MX	GPOE	HCH ER	CP, tx'd in MX	E	437			self-pay

Total:
14

US=8
MX=6
to GPOE=0
to HCH ER=6

E=8 **$5,701**
T=4
MVA=2
fx/sp=1
other=1

Nogales Fire Department cross-border transports for Nov 2001

Run #	Nationality	Pick-up site	Destination	Chief Complaint	Category	Charge ($)	Reimbursed ($)	Difference ($)	Payment Type
1710	MX	GPOE	HCH ER	MVA, subdural hematoma, tx'd in MX	T-MVA	437			self-pay
1735	US	GPOE	HCH ER	CP, shoulder pain, tx'd in MX	E	437			insurance
1735	US	GPOE	HCH ER	MVA, shoulder injury	T-MVA	437			self-pay
1748	US	GPOE	HCH ER	labor pains	E	437			self-pay
1758	US	GPOE	HCH ER	seizures, tx'd in MX	E	437			self-pay
1779	US	GPOE	HCH ER	muscle spasms	no	437			self-pay
1782	MX	WPOE	HCH ER	assault-jumper, EtOH	E	431			self-pay
1811	MX	WPOE	HCH ER	LOC, seizures	E	437			self-pay
1827	MX	GPOE	HCH ER	OD	E	437			self-pay
1836	MX	GPOE	HCH ER	CVA, tx'd in MX	E	437			self-pay
1847	US	GPOE	HCH ER	labor pains	E	437			self-pay
1850	US	GPOE	HCH ER	infant, dehydration	E	437			self-pay
1851	US	GPOE	HCH ER	fall injury, hypoglycemia	E	437			insurance
1854	US	GPOE	HCH ER	weakness, light-headed	E	437			insurance
unknown	US	GPOE	HCH ER	CVA, tx'd in MX	E	431			unknown

Total:
15
US=10
MX=5
to GPOE=0
to HCH ER=5

E=12
T=2
MVA=2

$6,543

Nogales Fire Department cross-border transports for Dec 2001

Run #	Nationality	Pick-up site	Destination	Chief Complaint	Category	Charge ($)	Reimbursed ($)	Difference ($)	Payment Type
1897	US	GPOE	HCH ER	head lac	T-other	437			insurance
1906	US	GPOE	HCH ER	head injury, tx'd in MX	T-other	431			insurance
1922	US	GPOE	HCH ER	MVA, multiple fx	T-MVA, -fx/sp	437			self-pay
1936	US	GPOE	HCH ER	concussion	T-MVA	431			insurance
1952	US	GPOE	HCH ER	eye lac, EtOH	T-other	437			self-pay
1964	US	WPOE	HCH ER	EtOH intox	no	437			self-pay
1976	MX	GPOE	airport	burn injury	T-burns	485			self-pay
2003	US	GPOE	HCH ER	CVA	E	431			self-pay
2004	US	GPOE	HCH ER	fall injury, leg pain	T-other	431			insurance
2010	MX	GPOE	HCH ER	LOC, head injury	T-other	437			self-pay
2035	US	GPOE	HCH ER	assault-lac, dizzyness	T-assault	437			self-pay
2039	US	GPOE	HCH ER	rape by Nogales, SO PD officers	T-rape	431			insurance
2047	MX	GPOE	HCH ER	amputation, jumper	T-other	437			self-pay
2047	MX	HCH ER	GPOE	post-injury transport	no	431			self-pay
2061	US	GPOE	HCH ER	labor pain	E	437			self-pay
2069	US	GPOE	HCH ER	MVA, facial injury, tx'd in MX	T-MVA	437			self-pay

Total:
16

US=12
MX=4
to GPOE=1
to HCH ER=3

E=2
T=12
MVA=3
fx/sp=1
assault=1
rape=1
burns=1
other=6

$7,004

Nogales Fire Department cross-border tranports for Jan 2002

Run #	Nationality	Pick-up site	Destination	Chief Complaint	Category	Charge ($)	Reimbursed ($)	Difference ($)	Payment Type
14	US	GPOE	HCH ER	SOB, tx'd in MX	E	437			self-pay
15	US	GPOE	HCH ER	abd pain	E	431			insurance
20	US	GPOE	HCH ER	CP	E	431			insurance
30	US	WPOE	HCH ER	MVA, neck pain	T-MVA	431			insurance
35	MX	GPOE	HCH ER	resp distress, tx'd in MX for pneumonia	E	437			self-pay
50	US	GPOE	HCH ER	MVA-shoulder injury	T-MVA	431			self-pay
56	MX	GPOE	HCH ER	ankle fx, jumper	T-fx/sp	437			self-pay
66	MX	GPOE	HCH ER	post-op complications for appendectomy tx'd in MX	E	431			self-pay
68	US	GPOE	HCH ER	head, struck by MX PD	T-assault	437			self-pay
69	MX	GPOE	HCH ER	assault-shoulder pain, head	T-assault	437			self-pay
84	US	GPOE	HCH ER	ankle fx	T-fx/sp	443			insurance
111	US	GPOE	HCH ER	EtOH poisoning	E	437			insurance
126	US	GPOE	HCH ER	MVA-CP	T-MVA	437			insurance
154	US	GPOE	HCH ER	assault-, EtOH	T-assault	218			self-pay
154	US	GPOE	HCH ER	assault, EtOH	T-assault	218			self-pay
161	US	GPOE	HCH ER	abd pain, in customs custody	E	437			self-pay

Total:
16

US=12
MX=4
to GPOE=0
to HCH ER=4

E=7
T=9
MVA=3
assault=4
fx/sp=2

$6,530

Nogales Fire Department cross-border transports for Feb 2002

Run #	Nationality	Pick-up site	Destination	Chief Complaint	Category	Charge ($)	Reimbursed ($)	Difference ($)	Payment Type
204	US	GPOE	HCH ER	MVA-abd pain	T-MVA	437			self-pay
213	MX	WPOE	HCH ER	ankle fx, jumper	T-fx/sp	431			self-pay
246	MX	GPOE	HCH ER	ankle fx, jumper	T-fx/sp	437			self-pay
247	MX	GPOE	HCH ER	ankle fx, jumper	T-fx/sp	437			self-pay
270	MX	GPOE	HCH ER	ankle fx, jumper	T-fx/sp	437			self-pay
274	MX	GPOE	HCH ER	head/neck injury, jumper	T-fx/sp	437			self-pay
284	MX	GPOE	HCH ER	HA, n/v, tx'd in MX	E	431			self-pay
290	US	GPOE	HCH ER	HA, post-surgery @TMC	E	437			insurance
296	US	GPOE	HCH ER	assault and fx	T-assault,-fx/sp	437			insurance
298	US	GPOE	HCH ER	rape	T-rape	437			insurance
310	US	GPOE	HCH ER	CP, cocaine	E	437			self-pay
321	MX	HCH ER	GPOE	post-injury transport	no	437			self-pay
336	MX	GPOE	HCH ER	ankle fx, jumper	T-fx/sp	437			self-pay
338	MX	HCH ER	GPOE	post-injury transport	no	437			self-pay
339	US	GPOE	HCH ER	leukemia dx'd in Hermosillo	no	437			insurance
350	MX	HCH ER	GPOE	post-injury transport	no	437			self-pay
359	US	GPOE	HCH ER	assault-back injury	T-assault	437			self-pay
361	MX	GPOE	HCH ER	ankle fx, jumper	T-fx/sp	437			self-pay
366	US	WPOE	HCH ER	MVA-abd and leg pain	T-MVA	431			self-pay
378	MX	GPOE	HCH ER	resp distress, tx'd in MX	E	437			self-pay

Total:

20

US=8

MX=12

to GPOE=3

to HCH ER=9

E=4

T=12

MVA=2

assault=2

fx/sp=8

rape=1

$8,722

Pan American Health Organization

"Mortality Profiles of the Sister Communities on the United States-Mexico Border"

Summary Reports:

A. **Update on the Leading Causes of Mortality on the US-Mexico Border (1995-97)**

B. **Leading Causes of Mortality on the US-Mexico Border (1992-94)**

Update on the leading Causes of Mortality on the United States - Mexico Border: 1995-1997

- Introduction
- Population and general mortality
- Leading causes of death

Introduction

The bilingual publication (in English and Spanish), *Mortality Profiles of the Sister Communities on the United States – Mexico Border, 2000 Edition* (1), produced by the Pan American Health Organization (PAHO) in collaboration with the governments of Mexico and the United States, includes the most recent mortality data for the border area of both countries. The aim of the publication was to update to the 1995-1997 period the overall profile of the patterns of mortality previously described in *Mortality Profiles of the Sister Communities on the United States–Mexico Border, 1992–1994* (2). The 2000 Edition continues to respond to the need for a comprehensive set of detailed reference tables on mortality with emphasis on smaller geographic areas and on the border area in particular. Although numerous communities have developed on both sides of the border, those with the largest populations were collectively designated by PAHO's Field Office/US–Mexico Border in El Paso, Texas, as the "Sister Communities." The counties or municipalities comprising the Sister Communities are shown in Figure 1 and became the unit of analysis. Mortality information from each Sister Community was aggregated to form the corresponding border totals reflecting overall mortality. To develop the mortality profiles of the border area, this information was then analyzed for leading causes of death and patterns of mortality in six broad causal groups and categorized by age and sex. The disparities shown in these profiles by cause, sex, and age group among the Sister Communities can be used to identify common problems and to establish comparisons between Sister Communities and the border region as a whole.

Mortality data for border areas of the United States were provided by the National Center for Health Statistics, U.S. Department of Health and Human Services, and those for Mexico were provided by the Dirección General de Estadística e Informática, Secretaría de Salud. Mid-year population estimates provided by the Consejo Nacional de Población (CONAPO) for Mexico and by the United States Bureau of the Census for the United States were used for the calculation of rates. Estimated populations for 1991–1997 were based on projections from the 1990 census in each country. Mortality and population data corresponding to national, state, and county/municipality levels by sex and cause were sent by both governments to PAHO's Special Program for Health Analysis where the information was processed, summarized, and analyzed. Tabulations were produced for selected cause groupings, seven broad age groups (under one year, 1-4, 5-14, 15-24, 25-44, 45-64 and 65 years and over) and by sex for the entire country, and for each of the Border States and Sister Communities. These data were then integrated into standardized formats to form a comprehensive set of reference tables and graphs. A synthesis of the main results follows.

Population and General Mortality

The 14 pairs of Sister Communities contain about 95% of the total United States–Mexico border population—an estimated 11 million people in 1997. Population growth during 1993–1997 in the border region has been rapid, averaging about 4.3% per year on Mexico's side of the border and 1.8% on the United States' side. A total of 177,909 deaths were registered during 1995–1997 among Sister Communities on both sides of the border, which corresponds to a crude mortality rate of 5.8 per 1,000 population. Of these, a total of 61,104 deaths were recorded among the Sister Communities of Mexico—a crude death rate of 4.7 per 1,000 population. On the United States side, a total of 116,805 deaths were recorded during 1995–1997, which represents a crude death rate of 6.7 per 1,000 population—a rate 43% higher than that on the Mexican side. However, the age-standardized mortality rate was 6.0 per 1,000 population on the Mexican border and 4.4 on the United States border (27% less). The overall age-standardized mortality rate for the combined United States–Mexico border region was 5.0 per 1,000 population.

Leading Causes of Death

The proportionate mortality corresponding to the five leading causes of death as a percentage of total deaths from defined causes in the United States–Mexico border region is shown by sex in Figure 2 (in PDF). Deaths from defined causes exclude causes assigned to the category "symptoms, signs and ill-defined conditions (ICD 9: 780–799)." It should be noted that the leading causes of death depend not only on the relative frequency of deaths in a category but also on the definition of the causal categories that are candidates for ranking. A "short" list containing 24 causal groupings of death was used to determine the leading causes of death.

As can be seen in Figure 2, the first five causes of mortality account for about one-half (56%) of the deaths from defined causes in the total population on the Mexico border and for over two-thirds (70%) of deaths on the United States border. They account for about 53% of the deaths in males and 60% in females from defined causes in border areas of Mexico and for 70% and 72% of male and female deaths, respectively, in border areas of the United States.

In the period 1995–1997, as in 1992–1994, the leading cause of death on the border was diseases of the heart (ICD 9: 390–429). In the Mexican Sister Communities, a total of 11,209 deaths (18.7% of deaths from defined causes) were recorded from heart disease. In contrast, mortality was 3 times greater in United States Sister Communities, with 33,420 deaths (29.8% of deaths from defined causes). Within this disease category, ischemic heart disease (ICD 9: 410–414) accounted for 67% of the deaths on the Mexico side and for 64% on the United States side. Proportionately, deaths from heart disease were slightly greater among women than men. On the Mexican border, heart disease accounted for a total of 4,966 female deaths (20.6% of female deaths from defined causes) and 6,242 male deaths (17.4% of male deaths from defined causes). On the United States border, heart disease had a much higher toll: 17,656 male deaths (29% of male deaths from defined causes) and 16,764 female deaths (30.6% of female deaths from defined causes).

Age-standardized death rates per 100,000 population are shown geographically in Figure 3 for the leading causes of death in the Sister Communities. These geographic

maps provide the spatial distributions and magnitudes of the leading causes of death and help to identify inequalities in the patterns of mortality. Age-standardized death rates from heart disease for 1995–1997 were 128.5 per 100,000 males and 121.5 per 100,000 females in Sister Communities of Mexico. These rates were 32.7% and 11.6% higher than corresponding nationwide rates for Mexico: males, 96.8; females, 108.9. In contrast, age-standardized rates in Sister Communities of the United States of 123.5 in males and 113.5 in females were 20.8% and 21.5% lower, respectively, than nationwide rates in the United States by sex. The United States Sister Communities also had rates that were 4% and 6.6% lower for males and females, respectively, than for their counterparts in Mexico.

Malignant tumors (ICD 9: 140–208) were ranked as the second leading cause of death on both sides of the border, with a total of 7,388 deaths in Sister Communities of Mexico and 26,657 deaths in Sister Communities of the United States. In the border communities of Mexico, malignant tumors accounted for 12.3% of all deaths from defined causes but the proportion was twice that (23.1%) on the United States side. A review of these deaths by tumor site indicates that, on the Mexico border, malignant neoplasms of the trachea, bronchus, and lung (ICD 9: 162) accounted for 17.3% of deaths; malignant neoplasms of the digestive organs and peritoneum (ICD 9: 150, 152, 155–159) accounted for 16.9% of deaths from malignant tumors; and malignant neoplasms of the cervix, uterus, body, and unspecified parts (ICD 9: 179, 180, 182) accounted for 9.1%. On the United States border, malignant neoplasms of the trachea, bronchus, and lung accounted for 25.5% of all malignant tumors, and malignant neoplasms of the female breast (ICD 9: 174) accounted for 8.3% of the total.

Accidents and adverse effects (ICD 9: E800–E949) were the third leading cause of death in the Sister Communities of Mexico, accounting for 6,346 deaths (10.6% of deaths from defined causes). In contrast, this group of causes was the fifth leading cause of death on the United States border, with 5,507 deaths — 4.8% of deaths from defined causes. However, among United States border males, accidents were the third leading cause of death, with 3,879 deaths (6.4% of male deaths from defined causes). Among Mexican border males, accidents ranked second as leading cause of death, with 5,048 deaths (14% of male deaths from defined causes). Among Mexican border females, deaths from accidents were the fifth leading cause, with 1,295 deaths (5.4% of female deaths from defined causes). However, among United States border females, accidents were not a leading cause of death. Motor vehicle accidents (ICD 9: E810–E825) accounted for 32.4% of deaths from all accidents on the Mexico side and for 45.2% of deaths in this cause group on the United States side. Also, it is of interest to note that accidents and adverse effects were the leading causes of death in all age groups up to 45 years of age (1–4, 5–14, 15–24, and 25–44) on both sides of the border.

The third leading cause of death in communities on the United States border was cerebrovascular disease, with 8,051 deaths, an age-standardized rate of 27.3 per 100,000 population. Nationally, the United States rate was 31.3 (14.7% higher). This disease also ranked third as a leading cause of female mortality with 4,662 deaths, an age-standardized rate of 31.7 per 100,000 population, and it ranked fourth as a cause of male mortality with 3,389 deaths (age-standardized rate of 23.1) in border communities of the United States. All border communities in the United States showed excess female mortality from cerebrovascular disease, with low masculinity mortality ratios calculated as the ratio of male:female age-standardized rates.

Diabetes mellitus (ICD 9: 250) was the fourth leading cause of death among Mexican communities on the border in 1995–1997. A total of 5,706 deaths were registered, accounting for 9.5% of the deaths from defined causes. Diabetes was also the fourth leading cause of death among Mexican border males, with 2,602 deaths recorded—7.2% of male deaths from defined causes. It was the third leading cause of death among Mexican border females, with 3,104 deaths or 12.9% of female deaths from defined causes. The following age-standardized death rates from diabetes were registered for the Mexico border: 63.5 in both sexes, 54.4 in males, and 73.1 in females. Compared with national data, the border rates were 27.6% higher for both sexes, 29.6% higher in males, and 26% higher in females. In comparison, diabetes mortality is about one-fifth the amount in areas of the United States border, with an age-standardized rate of 12.9 per 100,000 population. Compared with United States national data, age-standardized rates on the border were larger—about 0.3% overall (12.9 vs. 12.8), 1.5% higher in males but 1% lower in females.

The fourth leading cause of death in the United States border communities was chronic obstructive pulmonary disease (COPD) (ICD 9: 490–496), with 6,046 deaths, causing 5.2% of total deaths from defined causes. Among males in United States border communities, COPD ranked fifth, with 3,097 deaths (5.1% of male deaths from defined causes); among females it ranked fourth, with 2,949 deaths (5.4% of female deaths from defined causes). Age-standardized death rates from COPD were 20.4 per 100,000 population and 20.5 in males and 20.1 in females in border communities of the United States. These rates compared with United States national data were similar overall (21.0) but 8.6% lower than males nationally (22.3) and 1.4% higher than females nationally (19.8). Although COPD was not a leading cause of death in the border area of Mexico, it accounted for 1,757 deaths (2.9% of deaths from defined causes). The age-standardized rate of 20.2 per 100,000 population was about 1% less than in the United States border area. Masculinity mortality ratios show that mortality from COPD is predominant in men on both sides of the border.

Due to the relatively smaller numbers of deaths occurring in some Sister Communities, deaths over the period 1990–1997 were aggregated in order to determine the leading causes of death within each Sister Community. The leading cause of death in each community over this period was the same—diseases of the heart. Age-standardized rates ranged from a low of 101.3 per 100,000 population in Santa Cruz to a high of 180 in Agua Prieta. Among females, diseases of the heart was the leading cause of death in all communities on both sides of the border. Among males, the leading cause of death was also diseases of the heart in all but Tijuana, where it ranked second and accidents and adverse effects ranked first.

The second leading cause of death in 1990–1997 was malignant neoplasms in all but three communities—Tijuana, Nogales, and Ascención. In these communities, deaths from accidents and adverse effects were second and malignant neoplasms were third. Age-standardized rates for malignant neoplasms ranged from 64.1 in Anahuac to 111.4 in Pima. Among males, the second leading cause of death in 10 communities—Mexicali, San Luis Río Colorado, Nogales, Agua Prieta, Ascención, Juárez, Acuña, Nuevo Laredo, Reynosa, and Matamoros—was accidents and adverse effects; in Tijuana it was heart disease and in the remaining communities it was malignant neoplasms. Standardized rates from accidents and adverse effects ranged from 70.5 in San Luis Río Colorado to 130.4 in Ascención per 100,000 males, whereas standardized rates for malignant neoplasms ranged from 62.9 in Anahuac to 120.9 per 100,000 males in Pima. Among females, malignant neoplasms was the

second leading cause of death in all border communities except for Acuña and Piedras Negras, where diabetes mellitus ranked second with rates of 93.1 and 101.4, respectively. In these two communities, malignant neoplasms ranked third. Nogales had the lowest standardized death rate from malignant neoplasms (72.0 per 100,000 females) and the rate in Agua Prieta (111.6 per 100,000 females) was the highest.

The third leading cause of death in 10 communities—five in Mexico and five in the United States—was accidents and adverse effects. In the United States border communities of Santa Cruz, Pima, San Diego, Imperial, Cochise, Val Verde, and Webb, cerebrovascular disease was the third leading cause of death. In the Mexico border communities of Acuña, Nuevo Laredo, San Luis Río Colorado, Piedras Negras, and Anahuac as well as in Maverick, the third leading cause of death was diabetes and in Luna it was COPD.

Of the leading causes of death in 1990–1997, accidents and adverse effects ranked second, third, fourth, or fifth; cerebrovascular disease ranked fifth in Mexico communities and third or fourth in United States communities; COPD was a leading cause only in United States communities—third, fourth, or fifth; certain conditions originating in the perinatal period was a leading cause only in Mexico communities (fourth or fifth); homicide was a leading cause only in Ascención (fifth); diabetes was a leading cause and ranked third, fourth, or fifth; and acute respiratory infections was ranked as a leading cause of death (fifth) only in Ascención and San Diego.

Notes:
(1) Mortality Profiles of the Sister Communities on the Unites States-Mexico Border, 2000 Edition. Pan American Health Organization, 2000. (ISBN 92 75 17382 1)
(2) Mortality Profiles of the Sister Communities on the Unites States-Mexico Border, 1992-1994 (pdf - 3.25MB). Pan American Health Organization, 1999. (ISBN 92 75 07378 3)

View our previous report on Mortality on the US-Mexico border: Epidemiological Bulletin - Vol 20. No. 2, June 1999 (pdf - 326KB).

Source: PAHO. Special Program for Health Analysis (SHA)

Copies of the publication may be obtained through PAHO's Special Program for Health Analysis, at sha@paho.org

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Leading Causes of Mortality on the United States – Mexico Border

- Introduction
- Population and general mortality
- Leading causes of death
- Publication

Introduction

In a collaborative project carried out by the governments of Mexico and the United States and the Pan American Health Organization / World Health Organization (PAHO/WHO), the profiles and trends of mortality were determined for border areas of the United States and Mexico. The publication of this project responded to the need to provide a comprehensive set of detailed reference data on mortality corresponding to smaller geographic areas and to the border area in particular. Although numerous communities have developed on both sides of the border, those with the largest populations were of particular interest and collectively had been designated by the PAHO Field Office/US–Mexico Border in El Paso, Texas, as the "Sister Communities." The counties or municipalities comprising the Sister Communities are shown in Figure 1 and formed the unit of analysis. As part of this project and to enhance the analytical capability in epidemiology of national and local health professionals, a series of five workshops were held in selected Sister Communities along the border to review detailed mortality reference tables and graphs corresponding to the participant's respective "Sister Communities". Mortality information from each Sister Community was aggregated to form the corresponding border totals reflecting overall mortality. To develop the mortality profiles of the border area, this information was then analyzed for leading causes of death and patterns of mortality in six broad causal groups and categorized by age and sex. The disparities shown in these profiles by cause, sex, and age group among the Sister Communities can be used to indicate potential inequities in the health situation of the populations.

Mortality data, 1990-1994, for border areas of the United States were provided by the National Center for Health Statistics, U.S. Department of Health and Human Services, and those for Mexico were provided by the *Dirección General de Estadística e Informática, Secretaría de Salud*. Mid-year population estimates provided by the Consejo Nacional de Población (CONAPO) for Mexico and by the United States Bureau of the Census for the United States were used for the calculation of rates. Estimated populations for 1991–1994 were based on projections from the 1990 census in each country. Data corresponding to national, state, and county/municipality levels by sex and cause in seven broad age groups (under one year, 1-4, 5-14, 15-24, 25-44, 45-64 and 65 years and over) were sent by both governments to PAHO's Special Program for Health Analysis. These data were then integrated into a standardized format, processed, analyzed, and presented in a variety of formats to form a

comprehensive set of reference. This information was recently published in the bilingual (English and Spanish) publication *Mortality Profiles of the Sister Communities on the United States - Mexico Border, 1992-1994*.

TOP

Population and General Mortality

In 1994, about 90% of the United States–Mexico border population—an estimated 9.5 million persons lived in one of the 14 pairs of Sister Communities. Population growth during 1990–1994 in the border region has been rapid, averaging about 3.1% per year on the Mexico side of the border and 2.4% per year on the United States side of the border. A grand total of 166,602 deaths were registered during 1992–1994 among the Sister Communities on both sides of the border, corresponding to a crude mortality rate of 6.0 per 1,000 population. Of these, a total of 54,855 deaths were recorded among the Sister Communities of Mexico—a crude death rate of 4.9 per 1,000 population. On the United States side, a total of 111,747 deaths were recorded during 1992–1994, a crude death rate of 6.7 per 1,000 population—a rate 39% higher than that of the Mexican side. However, the age-adjusted mortality rate was 6.6 per 1,000 population on the Mexican border and 4.5 on the United States border (31.4% less). The overall age-adjusted mortality rate for the combined United States–Mexico border region was 5.2 per 1,000 population.

TOP

Leading Causes of Death

The proportionate mortality for the five leading causes of death as a percentage of total deaths from defined causes in the United States–Mexico border region is shown by sex in figure 2. Deaths from defined causes exclude causes assigned to the category "symptoms, signs and ill-defined conditions (ICD 9: 780–799)." It should be noted that the leading causes of death depend not only on the relative frequency of deaths in a category but also on the definition of the causal categories that are candidates for ranking. The "short" list used to determine the leading causes of death contained 24 causal groupings of death.

As can be seen in Figure 2, the first five causes of mortality account for about two-thirds of the deaths from defined causes in the total population on the Mexico border and nearly three-fourths (73.6%) of deaths on the United States border. They also account for about 65% of the deaths in males and females from defined causes in border areas of Mexico and for 72% and 76% of male and female deaths, respectively, in border areas of the United States.

In the 1992–1994 period the leading cause of death on the border was diseases of the heart (ICD 9: 390–429). In the Mexican Sister Communities, a total of 9,870 deaths (18.3% of deaths from defined causes) were recorded from heart disease. In contrast, mortality was 3 times greater in United States Sister Communities, with 33,040 deaths (29.9% of deaths from defined causes). Within this disease category, ischemic heart disease (ICD 9: 410–414) accounted for 64.9% of the deaths on the Mexico side and for 64.5% on the United States side. Proportionately, deaths from heart disease were slightly greater among women than men. On the Mexican border, heart disease accounted for a total of 4,292 female deaths (19.9% of female deaths

from defined causes) and 5,570 male deaths (17.3% of male deaths from defined causes). On the United States border, heart disease had a much higher toll: 17,195 male deaths (29% of male deaths from defined causes) and 15,845 female deaths (31% of female deaths from defined causes).

Age-adjusted death rates per 100,000 population from the leading causes of death for the Sister Communities are shown geographically in Figure 3. The geographic maps provide the spatial distributions and magnitudes with respect to the leading causes of death and help to identify inequalities in the patterns of mortality. Age-adjusted death rates from heart disease for 1992–1994 were 152.3 per 100,000 males and 127.1 per 100,000 females in Sister Communities of Mexico. These rates were 48.3% and 16.8% higher than corresponding nationwide rates for Mexico: males, 102.7; females, 108.8. In contrast, age-adjusted rates in Sister Communities of the United States of 132.2 in males and 115.0 in females were 20% and 21.9% lower, respectively, than nationwide rates in the United States by sex. The United States Sister Communities also had rates that were 13.2% and 9.5% lower for males and females, respectively, than for their counterparts in Mexico.

Malignant tumors (ICD 9: 140–208) were ranked as the second leading cause of death on both sides of the border, with a total of 6,615 deaths in Sister Communities of Mexico and 26,019 deaths in Sister Communities of the United States. In the border communities of Mexico, malignant tumors accounted for 12.3% of all deaths from defined causes but the proportion was twice that (23.5%) on the United States side. A review of these deaths by tumor site indicates that, on the Mexico border, malignant neoplasms of the digestive organs and peritoneum (ICD 9: 150, 152, 155–159) accounted for 16.5% of deaths from malignant tumors; malignant neoplasms of the trachea, bronchus, and lung (ICD 9: 162) accounted for 16.3%; and malignant neoplasms of the uterus (ICD 9: 179, 180, 182) accounted for 11%. On the United States border, malignant neoplasms of the trachea, bronchus, and lung accounted for 26.2% of all malignant tumors and malignant neoplasms of the female breast (ICD 9: 174) accounted for 8.3% of the total.

Accidents and adverse effects (ICD 9: E800–E949) were the third leading cause of death in the Sister Communities of Mexico, accounting for 6,237 deaths (11.6% of deaths from defined causes). In contrast, this group of causes was the fifth leading cause of death on the United States border, with 5,199 deaths — 4.7% of deaths from defined causes. However, among United States border males, accidents were the third leading cause of death, with 3,747 deaths (6.3% of male deaths from defined causes). Among Mexican border males, accidents ranked second as leading cause of death, with 4,847 deaths (15.1% of male deaths from defined causes). Among Mexican border females, deaths from accidents were the fifth leading cause, with 1,369 deaths (6.3% of female deaths from defined causes). However, among United States border females, accidents were not a leading cause of death. Motor vehicle accidents (ICD 9: E810–E825) accounted for 28.3% of deaths from all accidents on the Mexico side and for 49.3% of deaths in this cause group on the United States side. Also, it is of interest to note that accidents and adverse effects were the leading causes of death in all age groups up to 45 years of age (1–4, 5–14, 15–24, and 25–44) on both sides of the border.

The third leading cause of death in communities on the United States border was cerebrovascular disease, with 7,263 deaths, an age-adjusted rate of 26.7 per 100,000 population. Nationally, the United States rate was 30.5 (14.2% higher). This

disease also ranked third as a leading cause of female mortality with 4,240 deaths, an age-adjusted rate of 31.0 per 100,000 population, and it ranked fourth as a cause of male mortality with 3,023 deaths (age-adjusted rate of 22.5) in border communities of the United States. All border communities in the United States showed excess female mortality from cerebrovascular disease, with low masculinity mortality ratios calculated as the ratio of male:female age-adjusted rates

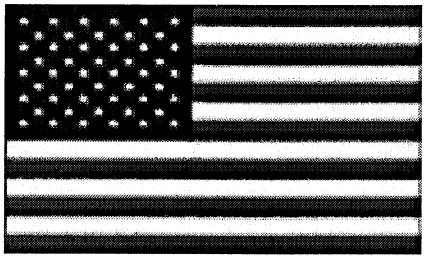
Diabetes mellitus (ICD 9: 250) was the fourth leading cause of death among Mexican communities on the border in 1992–1994. A total of 4,922 deaths were recorded, accounting for 9.2% of the deaths from defined causes. Diabetes was also the fourth leading cause of death among Mexican border males, with 2,273 deaths recorded—7.1% of male deaths from defined causes. It was the third leading cause of death among Mexican border females, with 2,646 deaths or 12.3% of female deaths from defined causes. The following age-adjusted death rates from diabetes were registered for the Mexico border: 68.7 in both sexes, 62.7 in males, and 74.6 in females. Compared with national data, the border rates were 43.7% higher for both sexes, 52.9% higher in males, and 36.1% higher in females. In comparison, diabetes mortality is about one-fifth the amount in areas of the United States border, with an age-adjusted rate of 11.3 per 100,000 population. Compared with United States national data, age-adjusted rates on the border were smaller—about 3% overall (11.7 vs. 11.3), 2% in males, and 6% in females.

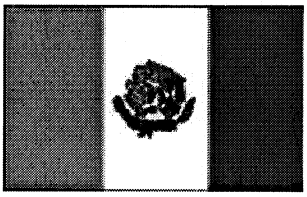
The fourth leading cause of death in the United States border communities was chronic obstructive pulmonary disease (ICD 9: 490–496), with 5,581 deaths, causing 5% of total deaths from defined causes. Among males in United States border communities, chronic obstructive pulmonary disease (COPD) ranked fifth, with 2,908 deaths (4.9% of male deaths from defined causes); among females it ranked fourth, with 2,673 deaths (5.2% of female deaths from defined causes). Age-adjusted death rates from COPD were 20.4 per 100,000 population and 21.1 in males and 19.6 in females in border communities of the United States. These rates compared with United States national data were similar overall (20.3) but 7.0% lower than males nationally (22.7) and 7.1% higher than females nationally (18.3). Although COPD was not a leading cause of death in the border area of Mexico, it accounted for 1,610 deaths (3.0% of deaths from defined causes). The age-adjusted rate of 23.8 per 100,000 population was 17% higher than in the United States border area. Masculinity mortality ratios show that mortality from COPD is predominant in men on both sides of the border.

Conditions originating in the perinatal period (ICD 9: 760–779) was not only the leading cause of infant mortality on both sides of the border but the fifth leading cause of overall mortality in the border areas of Mexico, accounting for 5.4% of deaths from defined causes.

TOP

Publication





Epidemiological Bulletin of the El Paso Field Office

July 24, 1998
No. 2

Note: Move your mouse over any superscripted number to view the information contained therein. Example: [1]

In this issue:

Injuries on the US-Mexico border - Motor vehicle accidents

USMBHA Resolution for the Surveillance of Injury and Violence Along the Border

Rubella outbreak update

About this issue's topics

Injuries on the US-Mexico border - Motor vehicle accidents

Injuries represent an important cause of morbidity, disability and mortality along the US-Mexico border. Since the consequences of injuries on the health of the border population are serious and susceptible to preventive measures they can be considered a priority health problem. The document "Mortality Profiles of the Sister Communities, 1992-1994" [1] illustrates the health situation of the US-Mexico sister communities with regard to injury-associated fatalities. In that document, injuries are included in the group of External Causes (codes E800 to E999 according to the ninth revision of the International Classification of Diseases, ICD-9) (Table 1). It should be noticed, however, that mortality data shows only part of the picture of the health problems associated to injuries.

Table 1. ICD-9 codes for the cause group of External Causes.

External Causes	**E800-E999 (ICD-9)**

Motor vehicle accidents	**E810-E825**
Accidental falls	**E880-E888**
Accidental drowning or submersion	**E910**
Accidental causes by machinery or cutting instruments	**E919, E920**
Accidents by firearm	**E922**
Remaining causes of accidents including late effects	**Rest of E800-E949**
Suicide and self inflicted injury	**E950-E959**
Homicide, legal intervention and operations of war	**E960-978, E990-E999**
Injury undetermined whether accidental or purposely inflicted	**E980-E989**

Looking at the mortality due to motor vehicle accidents during that period (1992-1994), the sister communities of the US-Mexico border registered an annual average of 1,442 deaths (mortality rate of 15.5 per 100,000 population). On the US border[2] , there was an average of 855 deaths per year with a mortality rate of 15.5 per 100,000 population. The mortality rate was higher in men than in women (rates of 21.6 and 9.4 per 100,000 population, respectively; masculinity index[3] : 2.3). On the Mexican border[4] , the annual number of deaths (average) was 588 with a mortality rate of 15.6 per 100,000 population. The mortality rate was higher in men than in women (rates of 24.4 and 6.8 per 100,000, respectively; masculinity index: 3.6). The age-adjusted rate for the Mexican border was 16.1 whereas for the US border was 14.6.

Deaths due to motor vehicle accidents represented 2.6% of all deaths in the sister communities (2.3% in the US counties and 3.2% in the Mexican municipalities). Table 2 presents motor vehicle accidents deaths as a percentage of total deaths in each of the sister communities.

Table 2. Percentage of all deaths due to motor vehicle accidents by sister community (all ages), 1992-1994.

	%
Tijuana/San Diego	**1.8**
Mexicali/Imperial	**3.9**
SLRC/Yuma	**3.2**
Nogales/Santa Cruz	**3.5**
Agua Prieta/Cochise	**3.0**
Pima*	**2.1**
Ascención/Luna	**2.6**
Juárez/Doña Ana/El Paso	**2.7**
Acuña/Valverde	**2.5**
Piedras Negras/Maverick	**1.4**
Anahuac**	**1.1**

Nuevo Laredo/Webb	**3.9**
Reynosa/Hidalgo	**4.6**
Matamoros/Cameron	**4.3**

*** Pima does not have a sister community on the Mexican side.**
**** Anahuac and Laredo have Webb as a sister community.**

Table 3 shows that Tijuana/San Diego, Juárez/Doña Ana/El Paso and Reynosa/Hidalgo accounted for 55.4% of all deaths due to motor vehicle accidents registered in the sister communities. It also indicates that the highest mortality rates were registered in Reynosa/Hidalgo, Matamoros/Cameron and Ascención/Luna (rates of 22.3, 21.5 and 20.6 per 100,000 population, respectively). Interpretation of this data warrants some caution since the number of events in some sister communities such as Ascención/Luna is small.

Table 3. Cumulative deaths, percentage and mortality rates per 100,000 population associated to motor vehicle accidents in the sister communities from 1992 to 1994.

	#	%	rate
Tijuana/San Diego	**1183**	**27.3**	**11.3**
Mexicali/Imperial	**471**	**10.9**	**18.8**
SLRC/Yuma	**147**	**3.4**	**19.2**
Nogales/Santa Cruz	**82**	**1.9**	**18.4**
Agua Prieta/Cochise	**96**	**2.2**	**22**
Pima*	**403**	**9.3**	**18.9**
Ascención/Luna	**24**	**.5**	**20.6**
Juárez/Doña Ana/El Paso	**717**	**16.6**	**14.4**
Acuña/Valverde	**44**	**1**	**14.5**
Piedras Negras/Maverick	**31**	**.7**	**7**
Anahuac**	**3**	**.1**	**5.4**
Nuevo Laredo/Webb	**229**	**5.3**	**19.8**
Reynosa/Hidalgo	**499**	**11.5**	**22.3**
Matamoros/Cameron	**398**	**9.2**	**21.5**
TOTAL	**4,327**	**100**	**15.5**

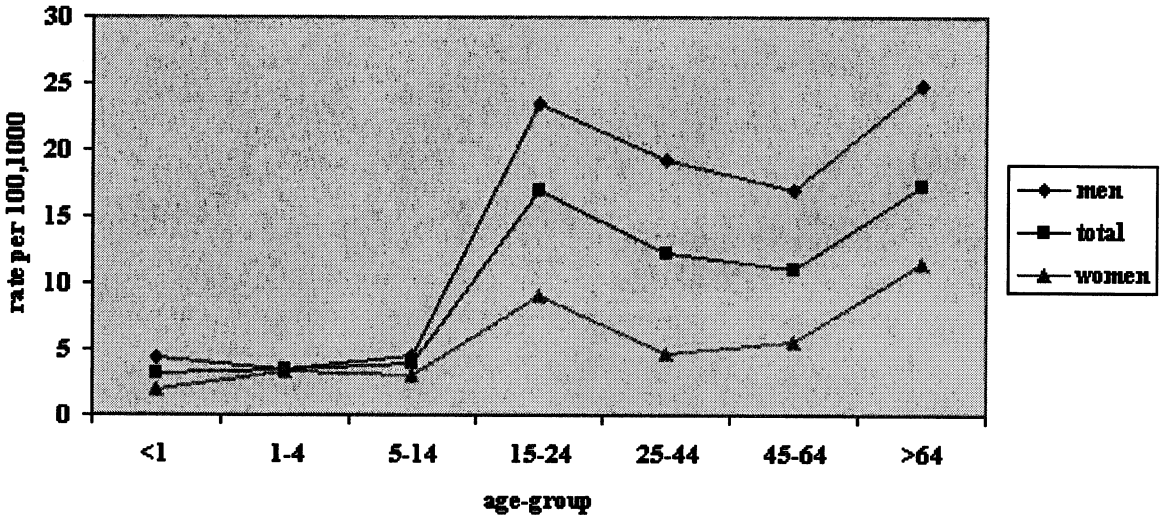
Table 4 shows that between 1990 and 1994, motor vehicle accidents mortality in Tijuana/San Diego declined (peak reporting year: 1991) whereas in Juárez/Doña Ana/El Paso and Reynosa/Hidalgo it increased (peak reporting year: 1993).

Table 4. Motor vehicle accidents deaths and age standardized rates per 100,000 population in selected sister communities, 1990-1994.

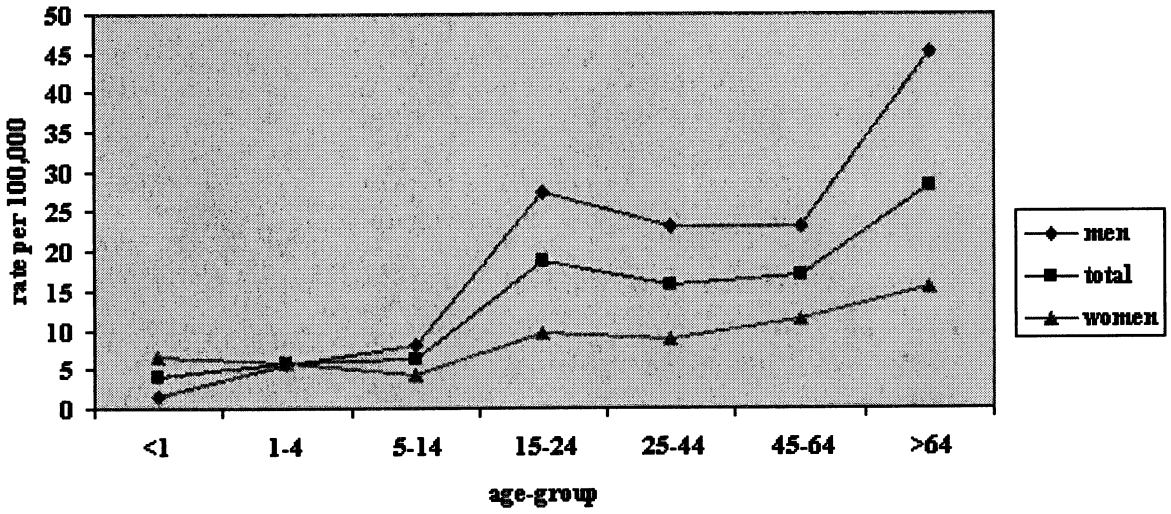
	1990		1991		1992		1993		1994	
	#	rate	#	rate	#	rate	#	rate	#	rate
Tij/SD	486	13.2	507	13.9	369	10	421	11.3	393	10.3
Juá/DA/EP	156	9.9	174	10.8	162	9.9	282	16.7	273	15.5
Rey/Hid	125	19	131	18.6	140	19.3	179	23.7	180	23.1

In Tijuana/San Diego and Juárez/Doña Ana/El Paso, the highest mortality rates were registered in the age groups of 65 or more (mortality rates of 17.2 and 28.2 per 100,000 population, respectively) and 15 to 24 (mortality rates of 17 and 18.7 per 100,000 population, respectively) (Graphs 1 & 2). In Reynosa/Hidalgo the highest mortality rates were registered in the age groups of 15-24 (mortality rate of 37.3 per 100,000 population) and 64 or more (mortality rate of 26 per 100,000 population) (Graph 3). In these three sister communities, mortality rates were higher for men at all ages except for infants and children under 5 in Juárez/Doña Ana/El Paso.

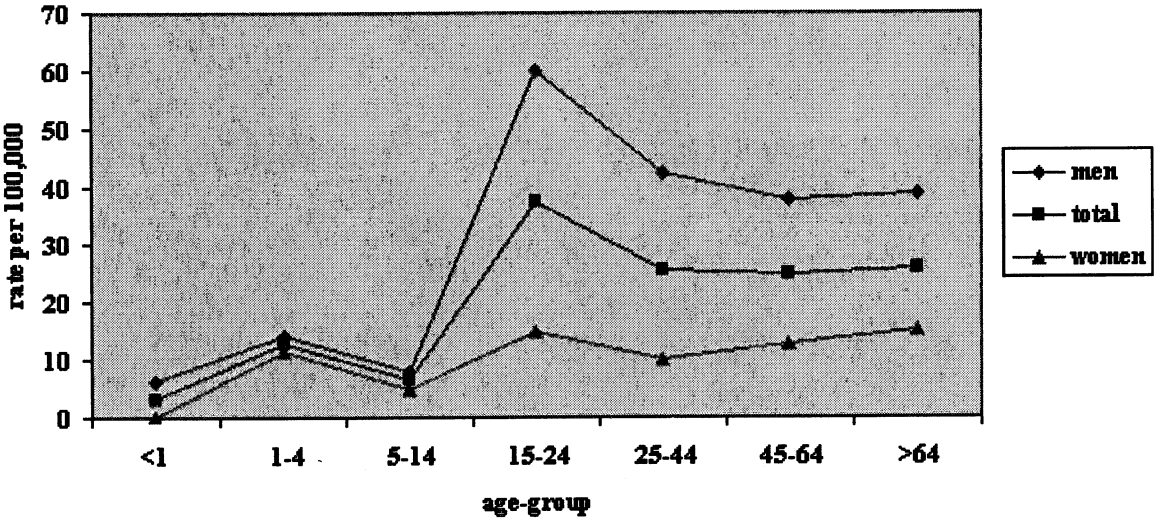
Graph 1. Age-group mortality rates due to motor vehicle accidents in Tijuana/San Diego, 1992-1994.



Graph 2. Age-group mortality rates due to motor vehicle accidents in Juárez/Doña Ana/El Paso, 1992-1994.



Graph 3. Age-group mortality rates due to motor vehicle accidents in Reynosa/Hidalgo, 1992-1994.



It is important to consider that another way of analyzing mortality due to motor vehicle accidents is through the use of the potential years of life lost (PYLL), particularly because accidents in general affect young people.

Source:
Mortality Profile of the Sister Communities, US-Mexico Border, 1992-1994. Document produced by the National Center for Health Statistics (US), the Dirección General de Informática y Estadística (México), the Health Situation Analysis Program and El Paso Field Office (PAHO). Document not available yet.

USMBHA Resolution for the Surveillance of Injury and Violence Along the Border

The following resolution was approved during the last United States-Mexico Border Health Association (USMBHA) Annual Meeting held in Monterrey (June 3-5, 1998). The request for its approval originated from the Annual Border Epidemiologists Meeting (Monterrey, June 2nd), which is now integrated with the USMBHA Annual Meeting.

Resolution:

Whereas, the sociocultural complexity and mobility of the U.S/Mexico Border populations render them difficult to monitor for public health purposes and the burden of injury and violence, in those populations is therefore poorly documented, and

Whereas, because the U.S./Mexico Border lacks an operational surveillance system that treats this unique zone as a functional unit, there is no accurate assessment of injury and violence arising there, and

Whereas, poor road and highway infrastructure, limited emergency medical services, and growing mobile populations combine to create conditions particularly conducive to injury and violence,

Therefore be it resolved:

That the members of the U.S/Mexico Border Health Association, support the development of a binational plan for the systematic surveillance for injury and violence.

Rubella outbreak update

	17th Week		25th Week	
	Cum. 1997	**Cum. 1998**	**Cum. 1997**	**Cum. 1998**
California	**4**	**1**	**7**	**2**
Arizona	**-**	**1**	**3**	**1**
New Mexico	**-**	**1**	**-**	**1**
Texas	**1**	**37**	**3**	**68**
Total USBS	**5**	**40**	**13**	**72**
Baja California	**363**	**58**	**655**	**69**
Sonora	**80**	**68**	**156**	**76**

Chihuahua	**19**	**1690**	**322**	**2,066**
Coahuila	**203**	**398**	**463**	**599**
Nuevo León	**518**	**591**	**783**	**887**
Tamaulipas	**128**	**3905**	**342**	**6,350**
Total MBS	**1,311**	**6,710**	**2,721**	**10,047**
Total USMBS	**1,316**	**6,750**	**2,734**	**10,119**

USBS=United States border states, MBS= Mexican border states, USMBS= United States-Mexico border states

Sources:
CDC (Centers for Disease Control). MMWR 1998;47(25):537.
CDC (Centers for Disease Control). MMWR 1998;47(17):361.
CDC (Centers for Disease Control). MMWR 1994;46(17):385
Secretaría de Salud de México. Epidemiología 1998, sem. 21-27 junio, vía internet (www.epi.org.mx)
Secretaría de Salud de México. Epidemiología 1998;15(19):12.
Secretaría de Salud de México. Epidemiología 1997;13(19):12.

About this issue's topics

We are in the process of creating a database on health issues relevant to the US-Mexico border, including the people working on such issues. The purpose is to make this information available and disseminate it through electronic media. We would appreciate if you take a couple of minutes of your time to answer the following questions.

Do you know an individual, group, organization or institution working in the area of injury and violence along the US-Mexico border?

Do you know any data sources or publications related to injury and violence along the border?

Do you have any suggestions or comments?

Contact us at epi@epfo.org

(915) 833-4768 (Fax)
(915) 581-6645 Ext. 25

APPENDIX L:
Outcomes Research Based On ICD-9 Coding Methodology Reference Abstracts and Injury-Related ICD-9 Codes

PMID: 11892825 [PubMed - indexed for MEDLINE]

1: J Trauma 1993 Oct;35(4):497-506; discussion 506-7

Injury severity grading in trauma patients: a simplified technique based upon
ICD-9 coding.

Rutledge R, Fakhry S, Baker C, Oller D.

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The purpose of this study was to develop a simplified method of stratifying patient risk of death based on ICD-9 codes. METHODS: Data were obtained from a statewide trauma registry. A mortality risk ratio (MRR) was derived from a "training" subset by calculating a mortality rate for each ICD-9 code of interest. The independent variables of interest included TS, ISS, and MRRs (for the 1st & 2nd Dx, 1st op, & E code). RESULTS: (n = 37,100). When the 1st Dx and ISS were used as candidate variables in stepwise multivariate modeling, the MRR for the 1st Dx was the first variable to be entered into the model (1st Dx partial R2 = 0.37, ISS partial R2 = 0.02). CONCLUSION: This study shows that the 1st Dx is a better predictor of outcome than ISS. Since ICD-9 codes are more easily obtained and are better predictors of outcome, this study suggests that they may supersede the use of the ISS in injury severity scoring.

PMID: 8411270 [PubMed - indexed for MEDLINE]

2: J Trauma 1997 Mar;42(3):477-87; discussion 487-9

Comparison of the Injury Severity Score and ICD-9 diagnosis codes as predictors of outcome in injury: analysis of 44,032 patients.

Rutledge R, Hoyt DB, Eastman AB, Sise MJ, Velky T, Canty T, Wachtel T, Osler TM.

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INTRODUCTION: Appropriate stratification of injury severity is a critical tool in the assessment of the treatment and the prevention of injury. Since its inception, the Injury Severity Score (ISS) has been the generally recognized "gold standard" for anatomic injury severity assessment. However, there is considerable time and expense involved in the collection of the information required to calculate an accurate ISS. In addition, the predictive power of the ISS has been shown to be limited. Previous work has demonstrated that the anatomic information about injury contained in the International Classification of Diseases

Version 9 (ICD-9) can be a significant predictor of survival in trauma patients. The goal of this study was to utilize the San Diego County Trauma Registry (SDTR), one of the nation's leading trauma registries, to compare the predictive power of the ISS with the predictive power of the information contained in the injured patients' ICD-9 diagnoses codes. It was our primary hypothesis that survival risk ratios derived from patients' ICD-9 diagnoses codes would be equal or better predictors of survival than the Injury
Severity Score. The implications of such a finding would have the potential for significant cost savings in the care of injured patients. METHODS: Data for the test population were obtained from the SDTR, which contains data from 1985 through 1993 from five participating hospitals. Four data sources were utilized to estimate the expected survival rate/mortality rate for each ICD-9 code in the SDTR. These were (1) the SDTR patients themselves, (2) the North Carolina State Hospital Discharge Database, (3) the North Carolina Trauma Registry Database, and (4) the Agency for Health Care Policy Research's Health Care Utilization Project Database. Each of these data sources was separately utilized to develop a survival risk ratio (SRR) for each ICD-9 diagnoses code. The SRR was calculated by dividing the number of survivors for patients with each ICD-9 code by the total number of all patients with the particular ICD-9 diagnoses code. The four groups of SRRs derived from our four data sources were used as predictors of survival and the ability of the SRRs to predict survival was compared with the predictive power of the ISS using measures of accuracy, sensitivity, specificity, and receiver operator characteristic curves. RESULTS: During the years 1985 through 1993, complete data were available for analysis on 44,032 patients. Of these, 2,848 patients died during their hospitalization (6%). Survival risk ratios were calculated for each of the diagnoses in the database. Logistic regression, using the SAS System for statistical analysis, was used to assess the relative predictive power of the ISS and the survival risk ratios derived from the ICD-9 diagnoses codes from each of the four data bases. The analyses demonstrated that the regression models using the SRRs were generally as good or better than ISS as predictors of survival. The predictive power of the SRRs derived from the SDTR data, the North Carolina Trauma Registry data and the Health Care Utilization Report data were the best. In a subsequent analysis, the SRR values and the ISS were added to the patient's age and the revised Trauma Scores to create new predictive models in the mode of TRISS methodology. The analyses again indicated that the models using SRRs had as good or better predictive power than the model using the ISS. CONCLUSIONS: The present study confirms previous work showing that survival risk ratios derived from injured patients' ICD-9 diagnoses codes are as good as or better than ISS as predictors of survival.

PMID: 9095116 [PubMed - indexed for MEDLINE]

3: J Trauma 1995 Apr;38(4):590-7; discussion 597-601

Injury severity and probability of survival assessment in trauma patients using
a predictive hierarchical network model derived from ICD-9 codes.

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Accurate assessment of injury severity is critical for decision making related to the prevention, triage, and treatment of injured patients. Presently, the standard method of controlling for variations of injury severity between groups has been based upon the Injury Severity Score (ISS) and the Trauma Score and the Trauma and Injury Severity Score (TRISS) methodology. The purpose of this study was to attempt to build upon previous work using International Classification of Diseases, ninth revision (ICD-9) coded diagnosis, and procedure information available from standard hospital discharge abstracts (UB-82 Billing format) to create a hierarchical network to provide a tool for predicting injury severity and probability of survival. METHODS: Data were obtained for this analysis from the North Carolina Medical Database. Data were available on all trauma patients admitted to hospitals in North Carolina from January 1, 1988 until June 30, 1992. The dependent variable of interest was the patient's survival after injury, coded as live or die. The independent variables used in the study included the ISS derived using the technique described by MacKenzie Abbreviated Injury Score (AIS) and body system maximum AIS scores, mortality risk ratios derived from the ICD-9-DM primary, secondary, and tertiary diagnoses, primary and secondary procedures as described in previous work, age and gender. Network generation used a commercial software package, AIM (Abtech Corp., Charlottesville, Va.), which is a numeric modeling tool that automatically "learns" knowledge from a data base of examples. RESULTS: In the test data set an ISS and a prediction of survival based upon the derived network were calculated for each and every patient. The relative predictive power of these two scores were compared by calculating the overall accuracy, sensitivity, and specificity and the false positive and false negative rates. The receiver operator characteristic curves demonstrate that the network is a more effective tool in predicting the outcome of trauma patients. All the measures of predictive power show that the network was the better predictor of outcome than the ISS. CONCLUSIONS: Given the recognized limitations of the ISS, the widespread availability of the ICD-9 coded diagnoses and procedures, and the availability of many state and regional data bases that have no ISS or Trauma Score, the purpose of this study was to assess the ability of a network derived from limited but widely available hospital discharge data to predict the outcome of injured patients. The study confirms previous work showing that the CD-9 codes were strongly associated with outcome. The study demonstrated that the network created from these data was a better predictor of outcome than the derived ISS. When the results of the network were compared with other published series, the network, created without access to physiologic information, was almost as accurate, sensitive, and specific as reported values for TRISS and A Severity Characterization of Trauma (ASCOT). Because the present study is the first of its type, further investigations are needed to validate these findings. If other studies corroborate this study, a network model based upon ICD-9 codes could become the principal method for grading injury severity. This would provide superior predictive power of injury severity with important cost savings and universal application.

PMID: 7723102 [PubMed - indexed for MEDLINE]

4: J Trauma 2000 Sep;49(3):530-40; discussion 540-1

Harborview assessment for risk of mortality: an improved measure of injury severity on the basis of ICD-9-CM.

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BACKGROUND: There have been several attempts to develop a scoring system that can accurately reflect the severity of a trauma patient's injuries, particularly with respect to the effect of the injury on survival. Current methodologies require unreliable physiologic data for the assignment of a survival probability and fail to account for the potential synergism of different injury combinations. The purpose of this study was to develop a scoring system to better estimate probability of mortality on the basis of information that is readily available from the hospital discharge sheet and does not rely on physiologic data. METHODS: Records from the trauma registry from an urban Level I trauma center were analyzed using logistic regression. Included in the regression were Internation Classification of Diseases-9th Rev (ICD-9CM) codes for anatomic injury, mechanism, intent, and preexisting medical conditions, as well as age. Two-way interaction terms for several combinations of injuries were also included in the regression model. The resulting Harborview Assessment for Risk of Mortality (HARM) score was then applied to an independent test data set and compared with Trauma and Injury Severity Score (TRISS) probability of survival and ICD-9-CM Injury Severity Score (ICISS) for ability to predict mortality using the area under the receiver operator characteristic curve. RESULTS: The HARM score was based on analysis of 16,042 records (design set). When applied to an independent validation set of 15,957 records, the area under the receiver operator characteristic curve (AUC) for HARM was 0.9592. This represented significantly better discrimination than both TRISS probability of survival (AUC = 0.9473, p = 0.005) and ICISS (AUC = 0.9402, p = 0.001). HARM also had a better calibration (Hosmer-Lemeshow statistic [HL] = 19.74) than TRISS (HL = 55.71) and ICISS (HL = 709.19). Physiologic data were incomplete for 6,124 records (38%) of the validation set; TRISS could not be calculated at all for these records. CONCLUSION: The HARM score is an effective tool for predicting probability of in-hospital mortality for trauma patients. It outperforms both the TRISS and ICD9-CM Injury Severity Score (ICISS) methodologies with respect to both discrimination and calibration, using information that is readily available from hospital discharge coding, and without requiring emergency department physiologic data.

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The end of the Injury Severity Score (ISS) and the Trauma and Injury Severity Score (TRISS): ICISS, an International Classification of Diseases, ninth revision-based prediction tool, outperforms both ISS and TRISS as predictors of trauma patient survival, hospital charges, and hospital length of stay.

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INTRODUCTION: Since their inception, the Injury Severity Score (ISS) and the Trauma and Injury Severity Score (TRISS) have been suggested as measures of the quality of trauma care. In concept, they are designed to accurately assess injury severity and predict expected outcomes. ICISS, an injury severity methodology based on International Classification of Diseases, Ninth Revision, codes, has been demonstrated to be superior to ISS and TRISS. The purpose of the present study was to compare the ability of TRISS to ICISS as predictors of survival and other outcomes of injury (hospital length of stay and hospital charges). It was our hypothesis that ICISS would outperform ISS and TRISS in each of these outcome predictions. METHODS: "Training" data for creation of ICISS predictions were obtained from a state hospital discharge data base. "Test" data were obtained from a state trauma registry. ISS, TRISS, and ICISS were compared as predictors of patient survival. They were also compared as indicators of resource utilization by assessing their ability to predict patient hospital length of stay and hospital charges. Finally, a neural network was trained on the ICISS values and applied to the test data set in an effort to further improve predictive power. The techniques were compared by comparing each patient's outcome as predicted by the model to the actual outcome. RESULTS: Seven thousand seven hundred five patients had complete data available for analysis. The ICISS was far more likely than ISS or TRISS to accurately predict every measure of outcome of injured patients tested, and the neural network further improved predictive power. CONCLUSION: In addition to predicting mortality, quality tools that can accurately predict resource utilization are necessary for effective trauma center quality-improvement programs. ICISS-derived predictions of survival, hospital charges, and hospital length of stay consistently outperformed those of ISS and TRISS. The neural network-augmented ICISS was even better. This and previous studies demonstrate that TRISS is a limited technique in predicting survival resource utilization. Because of the limitations of TRISS, it should be superseded by ICISS.

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ICD-9 CODES

(source: Pan American Health Organization. Mortality Profiles of the Sister Communities on the United States-Mexico Border (1992-94). pp. 124-126. Available at: http://www.paho.org/English/SHA/mortprofiles-usmb.pdf.)

Symptoms, signs and ill-defined conditions (780–799)
Sudden infant death syndrome (798.0)

1. **Communicable diseases [001–139, 320–322, 460–466, 480–487 (279.5, 279.6, or 042–044)]**
   - Intestinal infectious diseases (001–009)
   - Tuberculosis (010–018)
   - Acute respiratory infections (460–466, 480–487)
   - Human immunodeficiency virus infection (279.5, 279.6, or 042–044)
   - Other infectious and parasitic diseases including meningitis (remainder of 000–139, 320–322)

2. **Neoplasms (140–239)**
   - Malignant neoplasm of stomach (151)
   - Malignant neoplasm of colon and rectum (153, 154)
   - Other malignant neoplasm of digestive organs and peritoneum (150, 152, 155–159)
   - Malignant neoplasm of the trachea, bronchus, and lung (162)
   - Other malignant neoplasms of respiratory system and intrathoracic organs (160, 161, 163–165)
   - Malignant neoplasm of the female breast (174)
   - Malignant neoplasm of the cervix uteri and uterus, body and unspecified parts (179, 180, 182)
   - Malignant neoplasm of the prostate (185)
   - Malignant neoplasm of bladder and other genitourinary organs (183, 184, 186–189)
   - Malignant neoplasm of lymphatic and hematopoietic tissue (200–208)
   - Other malignant neoplasms (remainder of 140–208)
   - Benign neoplasms, carcinoma in situ, and neoplasms of uncertain behavior and of unspecified nature (210–239)

3. **Diseases of the circulatory system (390–459)**
   - Acute rheumatic fever and chronic rheumatic heart disease (390–398)
   - Hypertensive disease (401–405)
   - Ischemic heart disease (410–414)
   - Diseases of pulmonary circulation and other forms of heart disease (415–429)
   - Cerebrovascular disease (430–438)
   - Atherosclerosis (440)
   - Other diseases of the circulatory system (441–459)

4. **Certain conditions originating in the perinatal period (760–779)**
   - Obstetric complications affecting fetus or newborn and birth trauma (761–763, 767)
   - Hypoxia, birth asphyxia, and other respiratory conditions of fetus or newborn (768–770)
   - Other conditions originating in perinatal period (760, 764–766, 771–779)

5. **External causes of injury and poisoning (E800–E999)**
   - Motor vehicle accidents (E810–E825)
   - Accidental falls (E880–E888)
   - Accidental drowning and submersion (E910)
   - Accidents caused by machinery and by cutting and piercing instruments (E919, E920)
   - Accidents caused by firearm missile (E922)
   - Remaining causes of accidents, including late effects (remainder of E800–E949)
   - Suicide and self-inflicted injury (E950–E959)

- Homicide and injury purposely inflicted by other persons (E960–E969), injury resulting from operations of war (E990–E999), and injury due to legal intervention (E970–E978)
- Injury undetermined whether accidentally or purposely inflicted (E980–E989)

6. All other diseases (remainder of 001–779)
   - Diabetes mellitus (250)
   - Nutritional deficiencies and anemias (260–269, 280–285)
   - Diseases of nervous system, excluding meningitis (323–359)
   - Chronic obstructive pulmonary disease (490–496)
   - Other chronic respiratory diseases (500–508, 510–519)
   - Appendicitis, hernia of abdominal cavity, and intestinal obstructions (540–543, 550–553, 560)
   - Chronic liver disease and cirrhosis (571)
   - Diseases of other parts of the digestive system (530–537, 555–558, 562, 564–570, 572–575)
   - Nephritis, nephrotic syndrome, and nephrosis (580–589)
   - Other diseases of the urinary system (590–599)
   - Complications of pregnancy, childbirth, and the puerperium (630–676)
   - Congenital anomalies (740–759)
   - Residual (remainder of 001–779)

CAUSE GROUPINGS USED FOR RANKING LEADING CAUSES OF DEATH

(source: Pan American Health Organization. Mortality Profiles of the Sister Communities on the United States-Mexico Border (1992-94). pp. 124-126. Available at: http://www.paho.org/English/SHA/mortprofiles-usmb.pdf.)

Cause groupings	Grupos de causas	ICD-9 codes
Intestinal infectious diseases	Enfermedades infecciosas intestinales	001–009
Tuberculosis	Tuberculosis	010–018
Acute respiratory infections	Infecciones respiratorias agudas	460–466, 480–487
Human immunodeficiency virus infection (AIDS)	Síndrome de inmunodeficiencia adquirida (SIDA)	279.5, 279.6, or 042–044
Malignant neoplasms	Tumores malignos	140–208
Benign neoplasms, carcinoma in situ, and other neoplasms	Tumores benignos, carcinoma in situ y otros tumors	210–239
Diseases of the heart	Enfermedades del corazón	390–429
Cerebrovascular disease	Enfermedad cerebrovascular	430–438
Atherosclerosis	Aterosclerosis	440
Certain conditions originating in the perinatal period	Ciertas afecciones originadas en el periodo perinatal	760–779
Accidents and adverse effects	Accidentes y efectos adversos	E800–E949
Suicide and self-inflicted injury	Suicidio y lesiones autoinfligidas	E950–E959
Homicide, legal intervention, and operations of war	Homicidio, intervención legal, y operaciones de Guerra	E960–E978, E990–E999
Diabetes mellitus	Diabetes mellitus	250
Nutritional deficiencies and anemias	Deficiencias nutricionales y anemias	260–269, 280–285
Diseases of the nervous system, excluding meningitis	Enfermedad del sistema nervioso central excepto meningitis	323–359
Chronic obstructive pulmonary diseases	Enfermedades pulmonares obstructivas crónicas	490–496
Appendicitis, hernia of abdominal cavity, and intestinal obstruction	Apendicitis, hernia de la cavidad abdominal, y obstrucción intestinal	540–543, 550–553, 560
Chronic liver disease and cirrhosis	Cirrosis y otras enfermedades crónicas del hígado	571
Diseases of other parts of the digestive system	Enfermedades de otras partes del aparato digestivo	530–537, 555–558, 562, 564–570, 572–575
Nephritis, nephrotic syndrome, and Nephrosis	Nefritis, síndrome nefrótico, y nefrosis	580–589

Other diseases of the urinary system	Otras enfermedades del aparato urinario	590–599
Complications of pregnancy, childbirth, and the puerperium	Complicaciones del embarazo, parto y puerperio	630–676
Congenital anomalies	Anomalías congénitas	740–759

APPENDIX M:

Hospital General de Nogales

March 2001 Evaluation Results

(not included due to confidentiality restrictions)